

CALIFORNIA FISH AND GAME

"CONSERVATION OF WILD LIFE THROUGH EDUCATION"

Volume 12

SACRAMENTO, OCTOBER, 1926

Number 4

CONTENTS.

	Page
CONSERVATION OF THE GRUNION..... <i>Frances N. Clark</i>	161
A NEW FISHERY IN MEXICO..... <i>J. A. Craig</i>	166
NO MORE WASTE LAND..... <i>A. Rutledge</i>	169
LIFE HISTORY AND HABITS OF THE WESTERN MOURNING DOVE..... <i>Harold C. Bryant</i>	175
EDITORIALS	181
FACTS OF CURRENT INTEREST.....	198
COMMISSION ACTIVITIES.....	199
LIFE HISTORY NOTES.....	204
CONSERVATION IN OTHER STATES.....	206
REPORTS—	
VIOLATIONS OF FISH AND GAME LAWS.....	211
FINANCIAL REPORT.....	212
FISHERY PRODUCTS, APRIL TO JUNE, 1926.....	214
INDEX TO VOLUME TWELVE.....	217

THE CONSERVATION OF THE GRUNION.*

By FRANCES N. CLARK.

During the spring months of each year, a popular pastime for people who have ready access to the beaches of southern California, is grunion fishing. The lure of the beaches on moonlight nights and the novelty of picking up from the sand these very lively fish, cause vast crowds to gather when an abundant grunion run is expected. The beach towns appreciate the economic value of the large groups of people thus attracted to the beach and, to encourage their coming, local newspapers carry notices of the time of expected runs. The importance of grunion, therefore, is twofold: they benefit the coastal towns of southern Cali-

*Contribution No. 63 from the California State Fisheries Laboratory. August, 1926.

fornia by furnishing one more inducement to bring people to the beach, and also the people, both by furnishing a tasty addition to the beach supper or next morning's breakfast, and by supplying a novel form of recreation. For these reasons, the question of the conservation of this unique fish is of interest to all.

What effect the taking of these fish in such large numbers has had on the ultimate supply and what can be done to assure a continuance of the grunion runs must be considered. For a clear understanding of this problem it is necessary to know something about when the grunion can be expected to appear, and why they are to be found only on nights immediately following the high series of tides. From the work of Thompson¹ and Clark² the following facts are cited to explain when and why the fish make their appearance.

The grunion belongs to the family of fishes known scientifically as Atherinidae, and popularly as silver-side, or, erroneously, smelt. The fish appear on the beaches from March to August, although the largest runs occur with the favorable tides during April, May and June. The fish are to be found in the surf and on the beach for three or four nights following the full and dark of the moon. Since the heights of

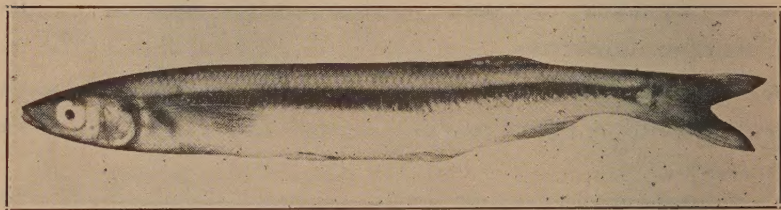


FIG. 30. The grunion, *Leuresthes tenuis*.

the tide fluctuate in two-week as well as daily cycles, series of maximum tides, termed spring tides, occur with the full and dark of the moon (see graph). It is with these maximum, fortnightly tides that the grunion runs are associated. Grunion may be taken in the surf shortly before the turn of the tide, but they do not appear on the beaches until after the tide has begun to recede. The run on any one night lasts about an hour. Popular belief is that the fish appear on the second, third and fourth nights after the full and dark of the moon, but while this holds true roughly, no hard and fast rule can be laid down as to the particular night on which a grunion run can be expected to begin.

The runs occur approximately every two weeks on each series of high tides, but as the season advances, the lag between the night on which the highest tide occurs and that on which a grunion run begins, becomes increasingly greater. Clark (*loc. cit.*) calculated that an approximate fifteen-day interval elapsed between the beginning of any two successive runs. Observations made during 1926 have helped to show that this usually holds true. The accompanying table and graph give the dates on which runs were seen in 1926, and illustrate the relation between spring tides and grunion runs. The first run observed for the

¹ Thompson, Will F., assisted by Julia Bell Thompson. The spawning of the grunion (*Leuresthes tenuis*). Calif. Fish and Game Comm. Fish Bull. No. 3, 1919.

² Clark, Frances N. The life-history of *Leuresthes tenuis*, an atherine fish with tide controlled spawning habits. Calif. Fish and Game Comm. Fish Bull. No. 10, 1925.

**Dates of Maximum Tides and Dates on Which Grunion Runs Were Observed
at Long Beach in 1926.**

Dates of highest tides	Dates of observed runs
March 30-----	March 30
March 31-----	March 31
April 1-----	April 1
April 12-----	April 13
	<i>April 14*</i>
	April 15
	April 16
April 28-----	<i>April 29</i>
April 29-----	April 30
	May 1
May 10-----	<i>May 14</i>
May 11-----	May 15
May 27-----	<i>May 29</i>
May 28-----	
June 8-----	
June 9-----	
June 25-----	
June 26-----	
July 7-----	July 12
July 8-----	<i>July 13</i>

*Dates in italics are the calculated dates for the beginning of a grunion run on the basis of a fifteen-day interval between the beginning of successive runs.

season was on the night of March 30. On a basis of fifteen days between the beginning of any two successive runs, the dates on which subsequent runs were expected to commence have been calculated, and are indicated in the second column of the table by italics. On April 13, a very small run was observed, while according to estimate the run would not have begun until April 14. On April 29, May 14 and May 29, the runs began on the calculated dates. Unfortunately, no observations were made in June. The next run observed was July 12, again one day before the calculated date. While it is not always possible to predict the exact date on which a grunion run will begin, the assumption of an approximate fifteen-day interval between spawnings is reliable in most instances. The table and chart also show that as the season advanced, the discrepancy between the date on which the tide was highest and the date of the beginning of a run of grunion became increasingly greater. In March the fish ran on nights when the tide was at its maximum, in April they averaged one day later, in May approximately two days, and in July four days.

To those who are primarily interested in obtaining a good catch of fish, the above facts are of chief importance. By the use of a reliable tide table, anyone can predict with fair certainty the date and time of appearance of the grunion. For those who are also interested in the maintenance of these runs, further facts are necessary.

That the grunion come up onto the sand in order to spawn, probably occurs to but few of the vast crowd of people who line the beaches waiting for a chance to catch the fish as soon as a wave recedes. The grunion collect in the surf for about an hour before high tide, and when

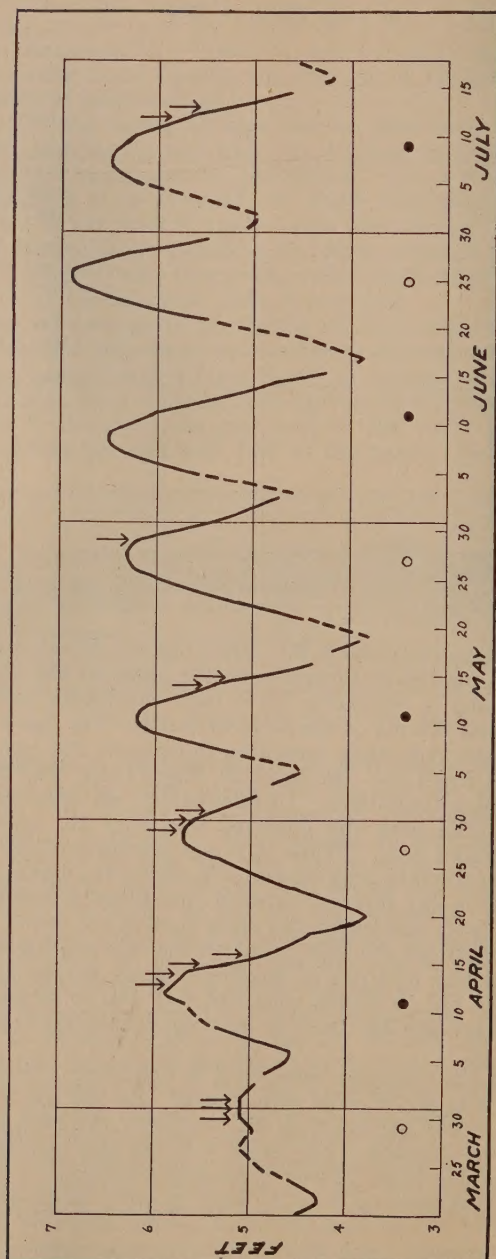


FIG. 31. Highest levels reached by tides each twenty-four hours at San Diego, March-July, 1926. Solid line indicates tides occurring at night, broken line, tides occurring during the day. Nights on which grunion runs were observed at Long Beach indicated by arrows. Tidal data taken from Pacific Coast Tide Tables for 1926, published by the U. S. Coast and Geodetic Survey.

the tide begins to ebb, wash up onto the sand with the highest waves. When a wave recedes, the fish are left on the sand, the female digs into the sand tail foremost and deposits her eggs as the male fertilizes them while lying arched around her. If the fish succeed in eluding capture, they flop back to the water or are washed back by the next wave. The eggs lie buried in the sand for two weeks until the next series of high tides digs them out. At this time the fish hatch and are washed out to sea. The individual fish spawn more than once during a season, returning to spawn on each series of high tides. The fish mature at the end of their first year and spawn for two or three years, but, as far as known, no fish has been found that has completed its fourth year. Most of the fish taken at the present time are spawning for their first season, having just completed their first year.

In 1919, when Thompson made observations on the runs, the grunion were found at Long Beach in great numbers. No difficulty was experienced in obtaining a good catch. Since that time the number of people coming to the beaches has increased tremendously, and the number of fish captured on each spawning run has been augmented in proportion. Observations made by members of the staff of the California State Fisheries Laboratory have indicated a steady decline in the size of the grunion runs at Long Beach until at the present time only a few fish are found where thousands once were seen.

It is not conceivable that any species could withstand the strain to which the grunion has been subjected during the past few years. At the present time, the number of people taking grunion is so great that depletion would undoubtedly have occurred even if each individual had been conscientious and taken only as many fish as he could actually use, and confined himself to picking up the fish on the beach. Unfortunately, people are carried away by the excitement of capturing the fish and go home with many more than can be utilized, with the usual result, the surplus find their way to the garbage can. Grunion fishermen have also discovered the fish can be caught more readily in the surf by the use of nets or screened frames than by the more sporting method of picking the fish up from the beach. That this is illegal, few people realize. The combination of these three factors—the rapid increase in the number of people coming to the beaches, the taking of more fish than can be used by the fishermen, and the illegal capture of the fish by nets, screens and other mechanical devices—has resulted in a dangerous depletion of the stock of grunion. The last two factors can be eliminated by a conscientious effort on the part of the people catching the fish, but this is not true of the first. The number of people coming to the beaches will undoubtedly continue to increase and, if the grunion runs are to continue as a valued attraction, some protective measure must be adopted.

A closed season during the first half of the spawning period is therefore suggested with the hope that it will afford some protection and possibly aid in building up the run. Such a season should extend from March 1 to May 31. This would allow four or five unmolested spawning runs, and fish hatched from these eggs would mature and spawn the following spring. Since the fish spawn more than once during the season, the individuals protected early in the season would return to the beaches during the open season, but would have had opportunity to

spawn at least once or twice before possible capture. The people in their turn would have the pleasure of grunion fishing during June, July and possibly August. From a biological viewpoint, to allow the extermination of the grunion is nothing short of criminal, since this fish is apparently unique in its spawning habits. From an economical standpoint, conservation is equally important. Protection now should mean a continuation of grunion runs, thus assuring recreation and pleasure for people in the future as well as at present. Such conservation measures, however, are possible only through the efforts of every citizen, both in bringing about the passage of protective laws and in loyally supporting these measures after their enactment.

A NEW FISHERY IN MEXICO.*

By J. A. CRAIG.

Within the last three years an unusual and interesting phase of our fishery relations with Mexico has developed. In 1923 the natives around Point San Felipe, on the northwestern coast of the Gulf of California, started to catch the large croakers, locally called "totuava," for their swim bladders.

This fish is the largest member of the family Sciaenidae and belongs to the subgenus *Cynoscion*. The species is *Cynoscion macdonaldi*. They often reach a weight of 170 pounds and superficially resemble our white sea bass, *Cynoscion nobilis*. At some seasons, especially in the spring, they are very numerous in the shallow water at the mouth of the Colorado River, and even enter the lower portion of the river itself.

The product secured from the swim bladder is called "buche" and is made by simply removing the bladder and as much of the peritoneum as possible, and drying it in the sun. Sometimes as much as three pounds of this dried material is secured from one fish. It is sold at a price of from \$1.50 to \$2 a pound to the Chinese, who consider it a great delicacy, and use it in chop suey and other dishes.

In this early period of the fishery, a small portion of the fish caught was filleted in large slabs and dried by the simple method of dipping the meat in a strong salt solution and hanging it in the sun to dry. By far the greater portion of the fish, however, was merely thrown away and allowed to decompose. The dried fish was used only locally by the natives. A small part of the catch is still dried and used in this way.

A fishing camp consisting of tents and brush huts sprang up where the fishing was conducted, and is now called San Felipe. It still exists in its first primitive condition with no permanent structures, and in the winter, when the "buche" season is at its height, contains about two hundred fishermen.

In 1924 men with trucks started going down and buying the fish and bringing them back to Calexico, where some were sold locally and the rest iced and trucked to the markets at San Diego. A market was found for the fish at Los Angeles also, and so they were soon being trucked to both places. From Calexico to San Felipe, it is 135 miles over the plains bordering the Colorado River. Most of the road is level

*Contribution No. 60 from the California State Fisheries Laboratory. June, 1926.

but very rough, and in some places it follows the course laid out by the pioneer who first drove his burros down there. Besides the roughness of the route, the road is sometimes covered with overflow water from the Colorado River when it is in flood, with the result that trucks are occasionally marooned until the water goes down. This all makes a long, hard haul for the trucks of about twelve hours or more from San Felipe to Calexico.

At Calexico the fish are iced and transferred to trucks with trailers, each truck with its trailer hauling about three tons of fish. The trucks then take the fish to the markets at Los Angeles or San Diego over paved highways. Most of the fish during 1925 and the spring of 1926 were sold in Los Angeles. The trucks go down and get loads as often as the market can absorb the fish. Most of the "totuava" is filleted and all of it is sold in the fresh fish markets. The flesh is of a fine flavor and firm, with good shipping qualities, but rather coarse.

As soon as a market was secured for the fish, other species were caught for exporting, as the waters adjacent to San Felipe are literally teeming with fish life.

Of the fish secured at San Felipe, the next in importance to the "totuava" is the "corbina," *Cynoscion xanthulus*, a member of the same family and subgenus. It is a much smaller fish than the "totuava," weighing from two to five pounds on the average. Like the "totuava," it is an excellent fish for shipping and has a fine flavor, and flesh of a much more delicate texture. These are the only two fish shipped in any quantities to Los Angeles.

Several other small fish are brought up to Calexico and sold to local trade, and at times a few are sent to San Diego. Mullet of fine size and quality are very abundant at San Felipe, as are also pompano and a fish locally called "cabrilla." One specimen of the latter identified was *Paralabrax maculatofasciatus*, but in all probability the fishermen and dealers also include under this name some larger and related species such as *Mycteroperca jordani*.

Mexican sierra, *Scomberomorus sierra*, are very plentiful and easily taken. They are beautiful fish, almost identical with the Spanish mackerel of the east coast, and are a most excellent food fish, but do not stand shipping as well as the "totuava" and "corbina," so consequently have not been used except locally about Calexico.

During the spring months there are numbers of large sea turtles caught at San Felipe. Most of them are harpooned, although a few are taken alive and shipped out to Los Angeles or San Diego. These turtles are very rich in fat and the principal object of their capture is to secure this oil. The turtles are cut up and the flesh and fat placed in large pans filled with water. The fat is then boiled out and allowed to separate from the water. After being cooled, it has about the consistency of soft lard, and is light yellow in color. It is packed in five-gallon oil cans and sold for a good price to druggists. The turtle meat remaining is salted and dried in the sun and used for food.

Prawns can be taken in large quantities and there are practically virgin beds of hard shell cockles, *Chione fructifraga*, or a closely allied species, near San Felipe.

The methods of catching the "corbina" and "totuava" are exceedingly simple and primitive. The fishermen fish from skiffs, there being but two or three motor boats at San Felipe and these are seldom used.

The tackle consists of a very stout line with a single large hook. For bait they use a small dead "corbina" or a piece of any other fish that is easily secured. The fish are so plentiful that they bite freely on this rough gear even when it is very poorly baited with fragments of flesh or skin of a fish. When a fish is secured it is hauled in by main strength and dispatched as quickly as possible.

During the 1925-1926 season, there were at San Felipe three Japanese who owned a round haul net. They did not take many "totuava" with this gear because of the size of the fish and the fact that they often got too many in one haul to get ashore or to use. Besides the fish are so easy to capture with hand lines that it does not pay to use a net.

There is one Mexican fisherman with a small round haul net who



FIG. 32. Mexican turtle just landed from coaster at San Diego. Photograph by E. Schaeffle.

keeps the Calexico market supplied with the smaller fish such as mullet, pompano and "cabrilla." The sierra can be taken either in the net or with hook and line.

The season for shipping fish out usually begins in October and lasts all through the winter and sometimes until April. The "buche" season is roughly of the same duration, as there is a closed season on the "totuava" from April 1 to October 1. During the summer months and the closed season, San Felipe is practically deserted, since there is no permanent town or anything to keep the fishermen there when no fishing operations are being conducted. Practically all of the fishermen are Mexicans or Indians. A few, however, are Japanese.

In spite of the trucking out of quantities of fish, there are still many fish left to rot after their swim bladders have been removed, as the primary object of the fishery is still the manufacture of "buche."

The waters adjacent to San Felipe would indeed be the location of a fine fishery if it were not so isolated from suitable markets, and if it had adequate routes of communication with some large centers of population. Also it would be a paradise for sportsmen, for who would not go many miles to battle, with light tackle, a 170-pound "totuava" or a leaping sierra?

NO MORE WASTE LAND.*

By A. RUTLEDGE.

A sign of that nature I had never seen before, and there was something so whimsical about it that it seemed the work of a humorist instead of the sage plea of a state game commission. Paraphrased roughly, it read something like this:

"Mr. Farmer, don't keep your place too clean. Leave that forlorn patch of scrub growing over yonder by the creek; leave that briered fence row; leave that bushy ditch bank just as it is. Your best friend of the great bird kingdom, bobwhite, can't live with you if you take away all his cover. Keep most fields clean, if you like, but leave some places deliberately disheveled for the sake of those who will leave you if you clean away their shelters. . . ."

This was a pertinent and a sensible request, put in a far more persuasive way than a cold announcement could have been put. And it serves to introduce a much wider subject, and one full of fascination for lovers of the outdoors and the creatures that, for all our proud so-called advancing civilization, remain distinctly Nature's children. Moreover, because of that very advance in man's civilization, the question is a vital one. It is this: What is the relation between our conquest of the earth and the fate to which that conquest may subject the creatures of the wild? Does the civilization of man mean the extinction of the beast? Well, it easily might.

Wild Life Back to the Land.

But there are two great saving elements in this difficult and dangerous situation. The first is that man stays his hand and opens his heart. He protects; he provides sanctuaries. Recognizing the beauty, the companionship, the economic value of wild life, he forgoes the pleasure of killing for the saner pleasure of keeping alive. The second saving factor is this: Wild creatures are singularly humble in their demands. They will take what we reject. They will occupy what we abandon. They will rejoice to inhabit our waste lands and our wildernesses. There is no place so apparently impossible for the habitation of man but can be

*We have seen no better presentation of the outstanding need for that necessity of every living species—food and cover—than that contained in the above article published in the Saturday Evening Post of July 31, 1926. It is reprinted by special permission from the Saturday Evening Post, copyright 1926 by the Curtis Publishing Company. It will stand a second reading by those who have already seen it as originally published.—Editor.

made into a home for wild creatures. It looks therefore as if, as civilization advances, man will acquire and keep all the choice localities; and at first by chance, and then deliberately, with mercy premeditated, he will apportion the waste lands to the wild children of the woods and the waters and the air.

For a great number of years I have been interested in the matter in question, and have been engaged from time to time in projects of restocking game preserves. If I can tell a few stories relative to this subject, I shall perhaps be most simply accomplishing my object—which is to show that, whether a man owns ten acres or ten thousand, it is wise and just and economic to quarter a portion of his holdings to the ancient inhabitants of the land, that will be glad enough to use whatever is unsuitable for purposes of man. Strictly, there is no such thing nowadays as waste land. A marsh becomes a mink and a muskrat home; an old rice field becomes a duck preserve; the junglelike growth that follows the felling of big timber becomes a sanctuary for deer and for ruffed grouse; the spouty patch in the cornfield's edge that can never be cultivated will grow cat-tails and witch grass and big briers that will protect the quail when the hunters and the red-tailed hawks are on the scene.

During the hunting season of 1925 I frequently went to a valley in southern Pennsylvania which well illustrates the principle that whatever man deserts Nature reclaims. In this valley, some eighteen miles long and two miles wide, almost every foot, clear up to where the mountain benches begin, used to be under cultivation. But one after one the hillside farms and the creek-bottom pastures have been deserted. People have moved to the nearby towns. In the whole valley now there are not more than eight or ten homes. And Nature, in her quiet, joyous way, has retaken what, centuries ago, in frontier days, was bitterly wrested from her and from the Indians.

As I roamed the deserted valley and the slopes above it I was curiously interested in the manner in which wild things were taking part in the recapture of their ancient home. Here in a deserted orchard, where a few gnarled apple trees still were bearing, deer had been munching the fallen fruit. In this old upland field where some volunteer buckwheat had sprung up, wild turkeys had been foraging. Beside a path-way leading from a collapsed mountain home to its inevitable spring I flushed two ruffed grouse. In the shellbark trees along the creek—trees that the farm boys used to raid for nuts—gray squirrels were gathering their winter supply of food. In the creek itself, where tame ducks were wont to go vacuum-cleaning, I flushed a score of migrating mallards.

Man comes, it seems, as a destroyer, but no sooner is his power relaxed than the timid legitimate dwellers in the land return to reclaim what they had been obliged to leave. All they seem to want is a bare chance. They can not occupy and increase in the face of high-power rifles, traps and shotguns; neither could man. But they are swift and valiant to return when the chance of getting killed is even slightly diminished.

My experience in this wild appealing valley, and experiences elsewhere of a similar nature, have led me to believe that there should be no such thing as waste land. Whatever situations man is too proud or lazy to occupy, wild creatures will humbly rejoice in.

Some places, indeed, are the better for game after man's invasion.

For example, the holder of a huge tract of yellow pine in the south told me this:

"Formerly," he said, "when all the big timber was standing, we had not a great many deer on the place. I think the woods were too open; practically the only cover was the broom grass. But eight years ago we cut about a thousand acres of pine. On that land a regular jungle grew up—myrtle, bays, huckleberries, gall berries, sparkleberries, and other brush of many kinds, much of it overrun with smilax and jasmine vines. As a result, there was ideal cover and to it the deer thronged. However, I noticed that the wild turkeys kept to the big timber. They do not like thickets, for in such places the wildcat and the fox have the best chance to operate against them. Deer will come to cut-over land, but turkeys will leave it until the second growth is fairly well developed."

It frequently happens that a situation that is attractive to wild life can be made positively irresistible merely by a little intelligent adjustment by the owner of the land.

I shall never forget with what amazement I looked upon a duck preserve near Oakley, South Carolina, some thirty miles up the Cooper River. Adjacent to the river were waste rice fields, long since abandoned, over which the tides of a generation had ebbed and flowed. Despite, however, these periodic inundations the general layout of the fields remained unchanged. There were the remnants of the ancient banks, the integrity of which had been partly maintained by the trees and bushes growing along them; there were the ditches and canals, in many cases widened and deepened by the dredging of the tides; there were the expanses of the fields, now grown to marsh and duck oats instead of to rice.

Such landscapes have been familiar to me since boyhood, but I was not prepared for the gorgeous spectacle of the wild life that thronged these fields. Mallards, green-winged and blue-winged teal, pintails, widgeons, wood ducks, a few canvasbacks, and black ducks, in thousands, were joyously feasting, preening themselves, tipping up in the warm shallow water, hailing all passing flocks with the glad tidings that the true paradise for wild fowl had at last been discovered. As I walked down a green bank, to the top of which the limpid water almost brimmed, I flushed a vast concourse. The whole field seemed to rise, yet as quickly settled back again. Many of the ducks flew so lazily and contentedly that I noticed they hardly drew up their feet under them. In these days of myriads of hunters and the last word in firearms I was frankly amazed to see such a sight, and asked the owner of the place, who was with me, to account for the wild-life vision that I was seeing.

The Formula for Wild Ducks.

"Three things have done it," he said. "These fields, you see, were worthless to me for planting purposes. But ducks have always come here. I decided first to post it carefully. Then, at a small outlay, I mended the banks and the trunks so that the fields can be made to hold water when once the water has flowed on them. A duck isn't going to light on dry land—not if there's water within reach of his wings. The third thing was the matter of feed. At some clubs rice and corn are fed regularly, but I can't afford to give them the things that keep me alive.

I went up to Washington and spent two or three days at the Department of Agriculture finding out just what wild food would grow here—things that the ducks like best. I had recommended to me duck oats, water lilies—you know that the ducks eat the little potato-like nodules on the roots—and the American lotus. This last is probably the most successful food I have tried. The bloom is like a big mallow, held high above the water; then a seed-holding disk is formed, in a general way like a sunflower; then the seeds come, like hard black acorns. And the ducks are crazy about them. Of course these seeds are shed into the mud when frost comes, and the ducks dive and forage for them.

Yes, these old fields were worthless, but in these days there is no such thing as waste land if a man will turn over to wild things those parts of his property which he can't use himself. And if he will encourage the wild life just a little he will have it coming in abundance. There are fields, just below me here on the river, of the very same character as mine, and they have comparatively few ducks visiting them. Reasonable quiet and protection, water, food—get those three conditions in this part of the country and you will have all the ducks you want."

This setting aside of sanctuaries, whether done as a private enterprise in conservation or whether done designedly by a state as a public duty, always has the same effect—the immediate and gratifying increase in wild life. But the effect is much more far-reaching than might be imagined. I know huge tracts of wild country, in Pennsylvania, in Virginia, in Maryland and in the Carolinas, which ten years ago were practically dead as far as game birds and animals are concerned. Now they are alive again, and the magic of this resurrection has been accomplished solely by the system of public sanctuaries or by the big preserves of private clubs.

Fortunately, game does not appear to distinguish between public and private preserves and sanctuaries; it will come to one as quickly as to another, and will also leave. The deer and the turkeys and the grouse that wander from the protected areas slowly repopulate the desolate hinterlands, and they also afford the humble average hunter with a little sport and with no end of exercise full of exciting promise. I know of a hunting club which, ostensibly organized to kill game, has yet been the greatest game preserver of the region where it exists.

On the southern coast the club has an ownership of perhaps sixty thousand acres. The place is unfenced; and though it is rigorously protected, no attempt is made to segregate the game within its ample borders. As a result, particularly in the summer when the cover is dense and when the woods are free from hunters, deer and turkeys in great numbers wander far beyond the boundaries of the club lands. The hinterlands, which had been combed of all their game, are once more replenished. The natives, who at first resented the coming of the great club and its exclusive ways, have now learned that a wild turkey for Christmas or for Thanksgiving and a pretty plentiful supply of venison all through the winter are due directly to the club's existence.

Gun Clubs as Game Protectors.

A fraternal feeling has come to prevail between the members of the club and their less fortunate neighbors; and it is a feeling which, rightly understood, is a promise of a new day in American sportsmanship. It is the feeling born of the conviction that game protection by

one man or one organization is game increase for other men and other organizations. This club did a rather unique thing for the sake of game preservation, and a sensible thing it was, too. On a deserted plantation that was bought to be added to the club preserve were some eight or ten negro families who were occupying the old slave quarters in the very heart of the deer country of the plantation. The club bought up some good property in a neighboring negro settlement safely outside the preserve, built there the required number of simple homes and moved the negroes there. They were only too glad to go, for the negro who is not gregarious does not exist.

Some twenty miles west of Gettysburg, on the Lincoln Highway, there is an inn. Within sight of the windows of the inn are the borders of a virgin forest fastness—one of the great game sanctuaries that the state of Pennsylvania has set aside for the use of wild creatures, and indirectly, of course, for the benefit of the hunters of the state. From that beautiful forest one can see trooping, especially in the late afternoon, small herds of whitetail deer, perhaps the most widely distributed of all American big-game animals and, in a way, the most characteristic wild creature of our country. It is heartening, in these days of swift transportation and deadly guns and rifles, while one is at dinner within a stone's throw of the Lincoln Highway, down which heavy traffic roars all the day long, to see genuinely wild creatures timidly stealing out of their coverts to nibble at a farmer's wheat or to browse on the tender green of his choice apple trees. The emotion with which I view such a sight is probably radically different from the farmer's.

Nevertheless, the presence of deer in a civilized community represents a definite triumph. Nor are these creatures pets. They are the real thing.

I remember seeing a huge old stag, the hero of many a thrilling escape on the nearby mountains, calmly munching apples within rifle shot of the hotel! Many of these deer—particularly the old bucks—seem to know quite well when the hunting season begins, and at that time they manifest a decided partiality for the sanctuary itself. Game recognizes a protected area; and though there is some straying and straggling, the sanctuary idea is wholly effective. It is not a bad thing for the sanctuary, for the adjoining orchardists and for the herds themselves for some deer to be killed each season.

Some twenty-five miles southwest of that inn is the Orquie Valley Sanctuary, a place in which I have spent much time. It is in much wilder country, though a good road runs through it. I knew it years ago, long before the state set it apart as a preserve. Then it was anybody's land, overrun by hunters, often burned out—a desolate wilderness. Now it is beautiful with heavy timber, with a lush undergrowth, musical with a fine trout stream roaring through its dewy coverts, protected from all marauders.

For several years, by some calculations which I believe to be accurate, I have ascertained that, but for this sanctuary, all the deer and turkeys of that region of the Tuscaroras would have disappeared. They have increased; and the increase, indeed the survival, the sanctuary made possible. On its borders now, every season, hunters have genuine sport; and if what escapes them gets into the preserve they feel that it is just as well. I think that there is a growing sentiment among

all hunters that all game should have at least one inviolate place into which it can not be pursued. A game sanctuary is not only a temporary life preserver, it is a guaranty of the survival of a race.

By all odds the most interesting game sanctuary I know is Bull's Island, one of the barrier group of the Carolina seaboard. Separated from the mainland by many deep salt waterways that wind through a vast sea marsh, it is effectively isolated. Nine miles long, three miles wide at its widest point, heavily wooded, rich in semitropical jungles, and having an abundant supply of fresh water, it is most fortunately appointed by Nature as a home for wild life. I believe that there is more game on this island than there is on any area of similar size in America, perhaps in the world; and its presence there is to be accounted for by methods of intelligent protection and sensible encouragement.

I remember walking one afternoon down through the lustrous thickets of this magic isle, and hardly for a moment was wild life out of sight or sound. I saw five flocks of wild turkeys—there are no foxes on the island—raccoons pacing sedately down the dim pathways aglow with the ruby lights of sunset, flocks of wild ducks speeding toward the reedy flows, and perhaps fifty deer. At one time I had twenty-six in sight, coming out of their daytime coverts to browse on the marsh edges and to roam securely the solitary country of the night. I walked up close to a stag that stood motionless in reeds as tall as his back. His massive neck and his regal head were all of him that showed. As I got too near he crouched slightly, hoping, I think, to be passed by; but then he changed his mind and went bounding off, his great flag erect and jerking from side to side.

Usually, after a day of travel through the wilds a man will have one or two vivid scenes of wild life to recall. On Bull's Island such scenes are bewildering in their number and variety.

Sane Control a Necessity.

Yet twenty years ago there were no turkeys on this preserve. There were few deer. The duck ponds were grown shut with choking aquatic plants. But a little ditching and draining deepened the ponds, so that now, on a midwinter's morning, mallards and black ducks pour into the idyllic lagoons that lie shielded by the virgin pine forests. Protection was all that the deer needed. I suppose there is no animal in the world that, considering its size and importance, responds more certainly to man's encouragement than does the whitetail deer. A barren doe is a rarity, and a great many have twin fawns.

Experts in permutations and combinations have estimated that a buck and a doe will, through their offspring, in fifty years produce thousands of descendants; and this will happen if the hand of man against them is stayed.

There are so many deer on this island now, and so frequent and fierce are the encounters of the bucks in the mating season, that it is necessary to kill off a certain number of stags every year. The oldest are killed so that the vigor of those in their prime will establish the stamina of the succeeding herds.

The case of the wild turkey is different and it is, I think, an interesting story. The owner of the island brought from the adjacent mainland

three wild-turkey eggs, and these were hatched under a hen and raised by her. Fortunately there were one gobbler and two hens. From such a start have come the splendid flocks now on the island. In this connection I do not see why it would not be possible to repopulate with wild turkeys many of those areas which in colonial days had an abundance of these magnificent birds. They have been brought back to Pennsylvania; in some regions in almost incredible numbers—I lay on my ground behind an old chestnut log last autumn in the mountains of Franklin County and carefully counted a flock of forty-three of these great birds. The Adirondacks should have as many turkeys as deer, and intelligent stocking would bring them back. It is not, of course, necessary to start with purely wild stock. A wild gobbler turned loose with six bronze hens will soon populate a wild tract with America's supreme game bird. Not long ago I was talking with an old mountaineer who complained that every spring his turkey hens wandered off into the hills where the wild gobblers were; and it is a common experience of turkey hunters to kill birds that have markings that unmistakably indicate their relationship to the tame variety.

I have spoken of Bull's Island as an extraordinary sanctuary for wild life; yet, for all its languorous beauty and exotic charm, it is not a good place for human habitation, except perhaps for a few winter months. In the old days it was pirate haunted, and now it has all the drawbacks of a tropical isle. In the sense that it is not a place where men would gladly live it is waste land, yet a veritable paradise for wild life it has become. Practically the same thing holds true for many of the great sanctuaries set aside on the Gulf Coast, the principle of the whole thing apparently being this: Whatever is rejected by man is, or may become, acceptable to wild things.

The earth was anciently theirs; they were here, it seems, before man; and they may survive when he is gone. They are in many ways better equipped for the adventure of living than men are. I sometimes think they are more gallant. Certainly they surpass us in the keenness of every one of their senses. Yet their fate is in our hands.

The idea of always associating the forward march of man with the destruction of all lesser forms of life appears to be giving way now to the saner and kindlier idea of preservation. Absurdly simple is the requirement for having beautiful wild life on your place: Don't kill it and don't clean away with Dutch immaculacy every vestige of that wild home that Nature provides. These wild things live humbly, drawing sustenance from Nature's own ample bosom. We must not rob them of their homes.

Let us have no more waste lands, but turn these, great and small, into sanctuaries for our wild things of woods and waters, fields and sky.

LIFE HISTORY AND HABITS OF THE WESTERN MOURNING DOVE.

By HAROLD C. BRYANT.

Among the game birds of California there is scarcely one so well known as the western mourning dove. It is distinctly a bird of the open country. During the summer season it is found throughout the



FIG. 33. The mourning dove. Courtesy National Association of Audubon Societies.

lowlands of the state, and a few birds are known to inhabit the pine belt of mountain slopes. The low, rolling foothills of the Sierra attract a vast number of these birds, and nowhere are they more abundant. In the vicinity of Folsom, Snelling and Chinese Camp the dove is the bird most frequently seen from the homestead or the highway. In the winter doves are scarcer, and in certain localities they may disappear entirely. They migrate south to warmer climes, and spend the winter along the coast of Mexico and Southern California, below the latitude of Santa Barbara, and on the adjacent islands. A few winter in the Sacramento and San Joaquin valleys. The bulk of the evidence indicates that this migration occurs in September, but a few birds linger until late in October.

About the first week in May the mourning dove returns to central California. At least observers report that doves become noticeably more abundant at this time. During spring and summer, mourning doves are nearly always found in pairs, but later on in the fall young birds as well as old congregate in flocks. Among all birds there are few that are so constantly seen in pairs. A scattered flock of doves will invariably resolve itself into pairs of birds.

There is little danger that any one will need to depend upon a written description of the mourning dove in order to make its acquaintance; but for the benefit of the few who are unfamiliar with it a brief description will not be out of place. The mourning dove is pigeon-like in most respects, except for its smaller size and long pointed tail, which is margined with white. The general tone of coloration is olive brown. The rapid whistling flight and the mournful coo of the male can more often be depended upon to identify this bird than a close view of its form and coloration.

The mourning dove has one of the longest breeding seasons of any native bird. Definite records are at hand that prove beyond a doubt that it nests as early as February and as late as the first part of December. The height of the nesting season covers the months of March to September. A minimum of two broods is reared, and in all probability three or four nestings are not uncommon. The nest is occasionally placed on the ground, but more often on a limb of a shrub or tree, from four to eight feet above the ground. Cases are known, however, where nests have been built at a height of forty feet. The nest itself is a crude structure, built of small sticks laid loosely together. In it two glossy white eggs are laid. The young are fed on "pigeon milk," by a process technically known as regurgitation. They grow rapidly and are soon ready for flight. Soon they are foraging widely for weedseeds, and taking daily flights with the adults to water.

The female mourning dove shows the greatest solicitude for her home. She is the most adept of birds at the ruse of the broken wing. When her nest is menaced she limps and flutters along the ground until the intruder is convinced that the bird is so badly injured that she may readily be caught. The deception is apparent only when the intruder finds himself led well away from the nest, and the bird takes flight in a normal manner. This habit appears to be largely limited to ground nesting species, and it is otherwise unusual to see a bird come flutter-

ing to the ground from a nest above. This particular instance is worthy of further study. Why this clever trick should be so markedly developed in some birds and entirely lacking in others has long puzzled scientists.

The coo of the male is a common sound early in the morning during the nesting season. Although made up of a succession of beautiful soft tones, yet the ensemble is so mournful that many people are disturbed by it.

Doves are dependent upon a good supply of water, and in the course of a day they will make several trips of many miles to drink. Because of this habit and because these birds fly out to the open fields for food there is usually a distinct "fly line" just at dusk when the birds are returning from feeding and watering. This gives the dove hunter an opportunity for wing shooting, and in southern California this sport is especially popular. During the open season certain foothill districts in Los Angeles County are so populated with hunters that unhampered open places are difficult to find. The gunner who desires to test his marksmanship on doves is assured of a savory reward if he proves his skill, for the young birds are tender and delicious.

Unless favorably located near a watering place, one bird in three or four shots makes a good average for all but the most experienced hunter. The small size and great speed make the bird a difficult target. The variety of shots possible is almost endless. Quartering and side shots are most difficult because of the speed of the birds in flight. Then come shots at towering or descending birds, often dependent on whether they are coming or going. The easier straight-away shots are to be expected less often in dove shooting than in quail shooting.

Thus it will be seen that dove hunting gives the best of practice to the lover of wing shooting. No finer test of skill is afforded unless it be in snipe shooting.

In defence of this sport the hunter rightly argues that doves are abundant, very prolific and capable of rapid recuperation; that rapid flight and a quick response to danger sufficiently protect them. Despite this argument there has been a growing sentiment of late that this bird should be taken from the list of game birds and protected throughout the year. Although of excellent flavor, the mourning dove can hardly be considered a desirable game bird because of its small size. When its esthetic value and its service to the agriculturist is taken into consideration the plea for total protection is justified.

Apart from man the dove has other enemies. The duck hawk is swift enough to overtake the dove, and this bird is probably the dove's most dreaded avian foe. Other predatory species take a toll during the nesting season. Its rapid flight frequently brings the dove in violent contact with telephone wires, and many birds die annually from this cause. Rodent poisoning operations have in recent years been responsible for the death of many doves; for, unlike the quail, the mourning dove and the band-tailed pigeon are both susceptible to strychnine, and, although the loss from this cause may not be great, it is unfortunate that it exists at all.

The mourning dove is to be numbered among those birds against which practically no complaint is made regarding depredations upon

crops. The small amount of grain taken in California is negligible and is so considered by ranchers. On the other hand, its value as a destroyer of the seeds of noxious weeds is unequalled by any other bird in the state.

Some idea of the enormous quantities of weed seeds consumed by doves can be obtained from the results of the examination of a dove's stomach and crop made by the United States Biological Survey:

	<i>Seeds</i>
Slender paspalum (<i>Paspalum setaceum</i>)-----	2,000
Orange hawkweed (<i>Hieracium auranticum</i>)-----	4,820
Hoary vervain (<i>Verbena stricta</i>)-----	950
Carolina cranesbill (<i>Geranium carolinianum</i>)-----	120
Yellow wood sorrell (<i>Oxalis stricta</i>)-----	50
Panic grass (<i>Panicum</i> sp.)-----	620
Other weeds of various kinds-----	40
Total-----	8,600



Fig. 34. Captive mourning doves foraging at the old Hayward Game Farm. Photograph by H. C. Bryant.

The examination of the crops and stomachs of doves taken in California has substantiated this evidence. The crop, and even the gullet, has been found filled to its utmost capacity with weed seeds. The stomach and crop of a dove taken at Lakeside, San Diego County, contained more than 100 seeds of the coyote vine or mock orange (*Cucurbita foetidissima*). Hundreds of seeds of filaree, mustard, turkey mullein and tumble weed have been taken from other stomachs. Examinations of nestling birds have shown that they are fed entirely on weed seeds. Since the seeds destroyed are those of some of the worst weed pests in the state, and since they are destroyed in such very large numbers, the western mourning dove must be considered a valuable bird from the economic standpoint.

The mourning dove makes a satisfactory aviary bird. Mr. L. W. Hammond of Fillmore, California, breeding from a single pair of doves, had a flock of over forty in the space of three years. Each female nested twice and reared two young each time. The nesting season of these captive birds began in March and continued through August. Aviculturists throughout the state have found the bird easily tamed and very prolific.

The game laws regarding open seasons on doves have been severely criticised, and correctly so, for they have allowed the killing of these

birds during the nesting season. Mourning doves often nest as late as September, and an open season beginning before the fifteenth of this month is to be deprecated, for it allows the killing of nesting birds. A list of sixty-six nesting records given in "The Game Birds of California" (Grinnell, Bryant and Storer, 1918, University Press, Berkeley) shows that nests have been found in every month of the year with the exception of October, November and January, and additional data would probably show records for these months also. The earliest record is for February 9, and the latest for December 5, both from Los Angeles County. The height of the nesting season is shown to be in June and July.

In the case of no other game bird in California has the general conservation principle of safety during the breeding season been so continuously violated. For many years, beginning in 1880, the dove season opened on July 1 and closed on January 1, an open season of six months. Since that time many changes have been made, but in deference to the sportsmen, who claimed that the doves leave the great valleys before September 1, the opening date was invariably set back to July 1. Even as late as 1907 the season opened on July 15. Since 1911 the dove season has opened on September 1. A reduction to three months and then to one month in northern California, and to two months in southern California has had beneficial results.

Owing partially to the popularity of dove hunting and also to the destruction of the birds during their nesting season, the dove is becoming much less numerous in many parts of the state. In many places where thousands were to be found ten or twenty years ago, the birds appearing each summer are now to be numbered in tens. This observation should be instrumental in bringing about laws which will give the proper protection to this bird. Judging from the sentiment in favor of giving the dove complete protection as a valuable friend of the agriculturist—a sentiment which is strong even among sportsmen—California may eventually take a stand with eastern states, and see that the dove is entirely protected. We take every precaution to prevent the loss of our personal possessions, but take little heed how we are robbed of the natural resources that we inherit jointly with our fellows. California may well show her appreciation of faithful service rendered, by better protecting her most valuable weed-seed destroyer, the mourning dove.

BIBLIOGRAPHY.

Bailey, F. M.

1916, Handbook of birds of the western United States. Houghton Mifflin Co., Boston and New York.

Beal, F. E. L.

1904, Some common birds in their relation to agriculture. Revised edition, U. S. Dept. of Agriculture, Farmer's bulletin No. 54. 48 pp. 22 figs. in text.

Dawson, W. L.

1923, Birds of California. The South Moulton Co., Los Angeles, California. 4 vols. 2121 pp. profusely illustrated.

Grinnell, J., Bryant, H. C., and Storer, T. I.

1918, The game birds of California. University Press, Berkeley, California. 642 pp. 16 pls., 94 figs. in text.

Grinnell, J., and Storer, T. I.

1924, Animal life in the Yosemite. University Press, Berkeley, California. 752 pp. 60 pls., 2 maps.

Hammond, L. W.

1916, Mourning doves bred in captivity. California Fish and Game, vol. 2, p. 163.

CALIFORNIA FISH AND GAME

A publication devoted to the conservation of wild life and published quarterly by the California State Fish and Game Commission.

Sent free to citizens of the State of California. Offered in exchange for ornithological, mammalogical and similar periodicals.

The articles published in CALIFORNIA FISH AND GAME are not copyrighted and may be reproduced in other periodicals, provided due credit is given the California Fish and Game Commission. Editors of newspapers and periodicals are invited to make use of pertinent material.

All material for publication should be sent to H. C. Bryant, Museum of Vertebrate Zoology, Berkeley, Cal.

November 23, 1926.

"Bringing an appreciation of the importance of conservation to the background of human consciousness is a work which can not be done by one man or one organization in one year, or by many men and many organizations in many years."

NEW MOTION PICTURE FILMS OBTAINED.

Purchase of motion picture film from two well known photographers of wild life, Donald Dickey and E. S. Cheney, together with additional film secured by the Bureau of Education and Research, has made possible some new reels with the following titles:

CALIFORNIA SONG BIRDS: Their home life. (Western Mockingbird, California Bush-tit, Western House Wren, Plain Titmouse, Russet-backed Thrush and Black-crowned Night Heron, Anna Hummingbird, Steller Jay.)

BIRDS OF PREY: Common hawks and owls. (Bald Eagle, Golden Eagle, Pacific Horned Owl, Turkey Buzzard.)

GAME MAMMALS OF CALIFORNIA (Mule Deer, Black-tailed Deer, Valley Elk, Black Bear).

UPLAND GAME BIRDS (Sierra Grouse, Band-tailed Pigeon, A Valley Quail Hunt).

CALIFORNIA WILD-FOWL (Ducks and Geese in Flight, Whistling Swan, Mallard, Coot, Ducks on Lake Merritt Game Refuge).

The above films have been assembled and titled and are now available. These films are loaned without charge to responsible organizations. A regular booking loan system is maintained. It is desirable whenever possible to arrange for several showings in the same general locality to justify the express charges. Many depu-

ties have made arrangements with local theaters for the showing of the commission's educational films and have arranged a circuit so that the films are shown on several successive days in various nearby cities. In displaying these films at schools it is particularly desirable to have a lecture accompany them. A lecturer will be furnished when a number of showings are to be made in the same vicinity, but it is expected that a suitable hall, lantern and competent operator will be provided.

STATE GAME FARM DEDICATED.

A formal dedication of the Yountville Game Farm took place on Sunday, August 22. The principal speaker of the day was Senator Herbert Slater, member and former chairman of the Fish and Game Committee of the State Senate, who appeared as the personal representative of Governor Friend Wm. Richardson. The acceptance was made by District Attorney Thomas C. Anglim of Napa County, an ardent sportsman and leading member of the Napa Sportsmen's Club. Dr. Robert Crees, president of the Napa Sportsmen's Club, presided. Superintendent August Bade pointed out that from the standpoint of soil, drainage and climate the game farm is wisely located. Other speakers on the program were: Hon. Frank L. Coombs, assemblyman from Napa County; Hon. Robert McPherson, assemblyman from Solano County; B. D. Marx Greene, executive officer California Fish and Game Commission, and Major Rolin G. Watkins, publicity director. A large crowd attended the ceremonies and it was afterwards shown about the game farm. All expressed their appreciation of the splendid progress and achievements at the farm.

YOSEMITE FISH HATCHERY DEDICATED.

August 1 was an important day in Yosemite National Park, for in addition to the celebration connected with the opening of the new state year-around highway, there were three dedication ceremonies. Of outstanding interest was the dedication of the Yosemite Hatchery. A large crowd gathered at the site near Happy Isles at 9.30 in the morning. Acting superintendent of Yosemite National Park presided. The first speaker was the Hon. Stephen T. Mather, director of the National Park Service, who spoke feelingly of the long years of endeavor in getting a hatchery for Yosemite and the splendid cooperation now existing between California and federal departments. The second speaker was Dr. Harold C. Bryant,

representative of the Fish and Game Commission, who spoke briefly on the subject, "Past and Present in Fishculture," describing the growth of fishcultural work and emphasizing the present policy of many local hatcheries. The last speaker of the day was Governor Friend Wm. Richardson, who described the reorganization of the Fish and Game Commission on the present efficient basis. In conclusion, he mentioned the importance of state and national cooperation and the friendly relations now existing. His suggested need for better financial support of conservation activities drew a hearty response from the audience.

violators. Every party searched treated them with courtesy save in one instance, where the party was composed of a policeman, a deputy sheriff and a dollar-a-year warden. Strange to say, these were the men who were impertinent and it was the volunteer guardian of California's wild life who asserted he needed no license to hunt. As soon as the matter was reported to the commission, this warden was promptly discharged and court procedure may be instituted against him.

LICENSE NUMBERS OF GAME VIOLATORS' CARS NEEDED.

A number of noteworthy cases have



FIG. 35. Governor Friend Wm. Richardson speaking at the dedication of the Yosemite Hatchery. Lloyd photograph.

WARDENS HAVE NO SPECIAL PRIVILEGES.

No complimentary hunting licenses are issued in the State of California. Neither the Governor of the state nor the Fish and Game Commissioners receive complimentary hunting or fishing licenses. It was surprising, therefore, that one of the new dollar-a-year wardens, sponsored by a midland county sportsmen's club, was found with a hunting party on the opening day of the deer season without a license. A group of dollar-a-year wardens from the bay district working with Deputy C. L. Bundock were after law

recently been made by deputies as a result of knowledge as to the license number of the automobile. Sometimes the most helpful thing an interested person can do is to secure several witnesses to a violation and then note the automobile license number. When evidence of this kind is reported to a deputy, he can proceed swiftly to the prosecution of the law violator.

ALKALI POISONING OF DUCKS.

As happened so often in dry years, large numbers of ducks died in various parts of the state last fall. This death of

ducks is not an entirely new thing, for evidence of it was reported from the region surrounding the Great Salt Lake at least twenty-five years ago. Serious inroads of the disease in 1910 brought about an investigation and in 1914 an explanation of the cause of the disease was given. In spite of additional knowledge as to causes and effect, no feasible remedy has been suggested. When the sick birds can be gathered and placed upon fresh water, they usually recover; likewise, when heavy rains come, the disease suddenly disappears. On the other hand, early rains which fill up dried alkali ponds and make attractive feeding places for wild fowl, usually cause an outbreak of the disease.

During early August reports of ducks dying at Tule Lake, in Modoc County, were brought to the attention of the Fish and Game Commission. Messrs. Roy Ludlum and Robert Irvine were immediately dispatched to investigate. As Mr. Ludlum is conversant with former outbreaks and Mr. Irvine is a chemist, they made a good team. The area was covered thoroughly for several days and a careful study of conditions made. Only a few ducks were found dead, and these were secured for post mortem examination. Several sick birds were brought back and used experimentally. No evidence of other disease has been secured as yet and apparently the cause of death was to be attributed, as in the past, to what has been called alkali poisoning.

DUCK DISEASE TO BE STUDIED.

Full facilities of the George William Hooper Foundation for Medical Research, together with the use of its auxiliary department for the study of game diseases which may occur, has been proffered the California Fish and Game Commission by Dr. K. F. Meyer, in charge of the foundation work in San Francisco.

Help is to be given in the study of the duck disease which appears so often around alkali lakes in California. Specimens recently obtained at Tule Lake are in the hands of experts of the foundation and bacterial and other tests are being made, looking toward better knowledge of means of control. Plans are also being made to utilize the same facilities in the study of deer diseases.

As one of the foremost students of the diseases of animals, both wild and domesticated, Dr. Meyer brings to investigations now under way facilities which would be wholly out of reach of the commission under ordinary circumstances.

STATE FAIR EXHIBIT.

The exhibit made by the Fish and Game Commission at the State Fair last September was divided into two sections. Near the main entrance a number of pens were erected and here there were displayed some of the birds from the State Game Farm. Six varieties of pheasants, Hungarian partridge and valley quail were on exhibition. This part of the exhibit was greatly appreciated by everyone. Crowds were often so great that it was almost impossible to approach the pens close enough to see the birds. Posters directed visitors to the main exhibit at the north end of the Horticultural Building, which as usual was planned and splendidly executed by W. H. Shebley, in charge Department of Fish Culture. The panorama used in former years was remodeled to represent Lake Tahoe and vicinity. The realistic painting and lighting effects were again the work of William G. Dobelstein, San Francisco artist. As in former years, the electrical display attracted much attention in that a very realistic storm effect was produced. The usual display of various kinds of trout and of methods in trout culture were utilized. The deputies in charge of the exhibit were in uniforms, giving visitors a chance to locate the men who might answer questions. Attendance was larger than ever before. It was estimated that 35,000 saw the exhibit on Admission Day and that the total attendance reached the quarter million mark. Visitors to the fair have found it to their advantage to visit the spectacular exhibits which have been arranged by the commission, and few there are who fail to view the panorama and the live trout.

NEW DOLLAR-A-YEAR WARDENS HELP LAW ENFORCEMENT.

Consensus of opinion is that the enforcement of the fish and game laws is becoming easier because of the help of dollar-a-year wardens and their deterrent effect on the violator. The violator, upon hearing that there are more than 100 under-cover men who may be encountered at any time, at any place, perhaps alongside him as he fishes a stream, is more careful, and there is a decreasing number of law violations. A number of cases have been made by these new men, and by their enthusiasm they are proving that this method of more effectively protecting fish and game is having satisfactory results.

PRESIDENT ZELLERBACH RECEIVES GOLD MEDAL.

Outdoor Life awards a gold medal to the man whose contribution to wild life

conservation is considered greatest. The past year this award came to the president of the California Fish and Game Commission, Mr. I. Zellerbach. Mr. Zellerbach's reorganization of the commission with resultant accomplishment brought to him this signal honor. A brief outline of accomplishments that may be attributed to him follows:

1. Installation of a business management of the commission's affairs with a business man in full charge as executive officer.

2. Incorporation of all expenditures of the commission under a strict budget.

3. Launching of a game farm—perhaps the largest in the world—near Yountville,

and fish ladder laws, and the enlistment of the best civil engineers in the employ of the public utilities corporations of the state in the task of devising a standard fish screen.

10. Inauguration of a cooperative, constructive fish and game policy for the benefit of all of the people of the state.

DUCK SEASON SHORTENED.

A change in the season for duck shooting, as promulgated by the Secretary of Agriculture earlier in the year, shortened the California season by fifteen days, opening under federal law on October 16 and closing under provisions of the state law on January 15. Under the laws



FIG. 36. Panorama of Tahoe region which attracted much favorable comment at the Fish and Game Commission's exhibit at the State Fair, September, 1926.

where game birds are being propagated for liberation in California valleys and mountains.

4. Establishment of 15 holding ponds where fish fry will be permitted to grow to from $3\frac{1}{2}$ to 5 inches in length.

5. Bringing of all wardens under strict civil service rules and requirements.

6. Calling of the first convention ever held of California fish and game wardens.

7. Strict enforcement, for the first time, of the law relating to reduction of fish, by fish packers, into fertilizers and poultry foods.

8. Strict enforcement, for the first time, of the laws relating to pollution of state waters.

9. Strict enforcement of the fish screen

existing prior to the new order issued by the United States Department of Agriculture, the season extended from October 1 to January 15, or three and one-half months in all. The California Fish and Game Commission immediately went on record as being in favor of a law to be submitted to the coming session of the California legislature adding fifteen days to the present existing season, making the closing date January 31 instead of January 15. This resolution was unanimously passed by the commission at its regular meeting on May 20, 1926. Pending a change by the state legislature, all deputies have been instructed to enforce to the letter the federal law.

WHAT WOULD YOU DO?

If you had gone to a sporting goods store and bought everything to go hunting, including in the outfit a perfectly good pair of binoculars. And if you had gone to the best deer country you knew the day before the season opened and had fixed up your camp to a queen's taste with high hopes of the morrow. And if when the morrow arrived you had swallowed your last bite of bacon and eggs and washed it down with a big draught of black coffee long before the break of day so you would be on the ground in time. And if after you had spent all morning in search of a buck and on your return to camp you had spied a whale of a buck and to make doubly sure had taken a look through your perfectly new binoculars and assured yourself it was a buck. Then if after looking with the glasses you were sure it was a buck and you had taken perfect aim, fired and killed it and had run over to where it fell with great anticipation. And if you found you had killed a doe, WHAT WOULD YOU DO?

Or, if you lived in or near Los Angeles and had traveled to the northeast part of Mendocino County, some four hundred miles, with great anticipation of the deer country and the opening of the season. And if you had wended your way out through the rough rugged rocky roads, that are not more than trails, to some secluded spot. And if you and your companion had just left camp on the morning of the opening day and your companion had sighted a buck and after looking at him with his glasses had said he was "an old whale and a three-pointer." And if he had told you to shoot while he watched and you had shot and scored a bull's eye, then found you had killed a spike buck, WHAT WOULD YOU DO?

Two men had exactly these experiences this fall. The first immediately went before the nearest judge and voluntarily paid a \$50 fine. The second man took the deer to the nearest ranger station and was sent to the nearest justice of the peace. Not finding him home, he took the deer to Judge Whitney at Ukiah. As a result, no charges were made and the deer was sent to the county farm.

Do you not agree that both men were real sportsmen?

What would you have done?—John K. Hellard, Willits, Cal.

FEDERAL POWER AND DUCK BAG LIMITS.

In order to clear up some prevalent misconceptions, the National Association

of Audubon Societies has made a study of "Federal Power and Duck Bag Limits" (Bulletin No. 6). A few of the most interesting facts brought out by this investigation are presented below:

It is untrue that 25 ducks per day may be killed every day throughout the federal season. Provided that ducks could be shot every day throughout the federal season, the average limit in the United States, as restricted by state laws, is approximately 15 a day.

But all states, except six, exercising their powers under the Enabling Act giving effect to the Migratory Bird Treaty, have laws further restricting the killing, either by reducing seasons, excluding Sundays, or by reducing daily, weekly, or seasonal limits, or by setting aside rest days on which ducks can not legally be shot.

State laws that result in reducing federal limits govern the legal limits.

Ducks are not native to any one state, but to the whole of the United States.

Those of California, Oregon and Washington are one great flock. How many ducks can be legally killed from this flock? Not the number permitted by law in any one of the states, but the average number legally permitted by this group of states as a unit, including adjacent states occupied by the same flock of ducks. The same holds true throughout the United States.

In law ducks are game birds. As such they are preserved for sport and food. Their economic value to the nation is high. It includes, besides food, employment and the whole train of industrial activities included in their chase.

Their unmeasurable value for recreation, including health-giving activities, is probably of still greater benefit to our people. The interest and unceasing work of sportsmen have been the forces which have so acted on public opinion as to bring about laws and methods to preserve the ducks. Nobody familiar with the history of game conservation could deny this fact.

A proportion of the people want wild fowl preserved, not for sport or food, but because of their enjoyment of wild life and of the beautiful in nature—a feeling shared also by sportsmen.

It is clear, however, that preserved up to their maximum numbers adjusted to the limits of their food supply, ducks will always provide a field of opportunity for nature lovers as great as that for sportsmen.

At present, ducks are probably at or beyond their food supply. Progressive drainage of marsh areas throughout the country and the lowering of the water level in some states have restricted their fall and winter habitats. They have been forced to concentrate in other areas and reduce their valuable food. These causes have led to disease and to the dangers of starvation; in some cases, to forced change of feeding habits, which have become a menace to crops.

Oil polluted and alkali waters annually destroy great numbers. Disease has been increasing. Adverse conditions on their breeding grounds have been destructive to ducks. How much we do not know, and can not know, until the breeding grounds shall be visited at the breeding time. Destruction of the food supply and methods of preserving and of increasing it. Droughts. An international treaty with Mexico. More systematic study of natural enemies. There are other serious factors.

This is the field that needs concentration and attention. In it, bag limits are insignificant factors. The agitation about them only diverts attention and work from being directed toward the vital problems.

AUDUBON SOCIETY HEAD LAUDS SPORTSMEN'S ORGANIZATIONS.

Here and there sportsmen's organizations of high type men have been formed. These groups as a rule pledge to observe the laws most carefully and it is to them that we are indebted for most of the wise, constructive legislation for protecting game in this country. Also they have collected and expended hundreds of thousands of dollars to secure prosecutions, to maintain game breeding farms, and to restock with game covers that have been depleted. They maintain a number of widely read magazines with militant editorial policies directed to the strengthening of conservation ideals.

Although enjoying the sport and the healthful exercise acquired by going afield with dog and gun, their killing is moderate and they constitute the largest effective force for the preservation of the game in the country. It is to be lamented that there are not more such organizations. Mr. John B. Burnham, president of the American Game Protective Association, advises me that the total organized sportsmen of the United States do not exceed 500,000, while the government reports that not less than 6,000,000 men go afield annually for the purpose of shooting. In a general way, I should divide the hunters of America into two groups, sportsmen and killers. The former should have our cooperative support, the latter need our earnest attention.

There is vast need for education along sane conservation lines in this country if the nation is to reap the greatest benefit from its natural supply of wild game birds.—T. Gilbert Pearson.

TRUE SPORTSMEN.

The way of the game warden would be made much easier if every hunter were as true a sportsman as are five guides of Monterey County. All parties engaging

these men are informed that should any of the employers violate in any way the bag limits or other game laws, the guides would immediately desert them and leave them to find their own way out of the Santa Lucia or Gabilan ranges.

RAREST OF BIRD'S EGGS DISCOVERED IN ALASKA.

Bird egg collectors have found and placed in museums specimens of the eggs of practically every known species of bird. A few species only have eluded the prowess of the egg collector. It remained for two scientists from the University of California, Museum of Vertebrate Zoology, Mr. Joseph Dixon and Mr. George Wright, to uncover the secret so long held by the surf bird *Aphriza virgata*. A well known winter migrant along the California coast, the surf bird nests in the far north and an expedition to the interior of Alaska was necessary, followed by long days of searching before the prize was obtained. The nest was found on the bare tundra high up on a mountain 1000 feet above timberline. The eggs, reported as buffy-brown in ground color with chocolate-brown and violet markings, were being incubated by the male bird, a common habit among shore birds. A full account of the discovery will appear in the January number of *The Condor*, a magazine of western ornithology.

BUFFALO ONCE NATIVE OF CALIFORNIA.

In 1922, Dr. C. Hart Merriam called attention to the fact that prior to 1850 the buffalo ranged as far west as the area termed "Eastern California," which usually meant eastern Utah or western Wyoming, and that there was no definite record for any locality west of eastern Oregon. In the *Journal of Mammalogy*, Vol. 7, pp. 211-214, he discusses further the western range of the buffalo and points out that inquiry has shown that the Pit River and northern Piute Indians knew the animal well and have much to say of its former range in their country. Dr. Merriam sums up the matter as follows: (1) The buffalo did not push westward around the south end of Great Salt Lake; (2) there is no record of its occurrence on the west side of Salt Lake, or in the valley of Humboldt River, or anywhere in the vast desert region between Great Salt Lake and California; (3) it entered California—and probably also a narrow strip along the extreme western border of northern Nevada—not

from the east but from the north, coming south from Oregon.

"With these facts in mind, the extension of the buffalo into the open valleys of northeastern California, carrying its range at least 250 miles southwest of Peter Ogden's record, marks another step in the knowledge of the distribution of this great animal—an animal that stands alone, whether viewed from the standpoint of food, clothing and shelter it afforded the original inhabitants, or from its influence in developing the traits of courage, alertness and skill for which our plains tribes were famous."

As a consequence, California must add this well known big game mammal to her list of extinct species.

BEAVER DISAPPEARING IN SAN JOAQUIN VALLEY.

Deputy George Smalley reports that no beaver sign is now to be found along the lower reaches of the Merced and San Joaquin rivers in Merced County. Since protection was removed from beavers at the last session of the legislature, nearly 750 beavers have been killed for their pelts in this region. It is estimated that between 275 and 300 were trapped near Mendota and fully 300 along the Merced River near Snelling. The pelts brought an average of \$15 apiece. Total protection brought beaver up in numbers to the point where they caused property damage. We are now noting the result of non-protection.

DUCKS SUCCESSFULLY REARED.

One of the finest collections of live ducks in the state is owned by J. V. De Laveaga of San Mateo. His collection now numbers 62 distinct species of ducks and 17 species of geese. He has varied, fulvous, white-faced, red-billed, gray-breasted, wood and spoon-bill ducks, European widgeon, rosy-billed pochard and Chilean pintail. Perhaps the most interesting bird that he has raised is a male white-eyed pochard. As far as is known, this is the only one of its kind in the United States.

CHEMICAL COMPOSITION OF FISH CHANGES WITH AGE.

Mr. A. S. Pearse of the Zoological Laboratory of the University of Wisconsin has written a very interesting article on "The Chemical Composition of Certain Fresh-water Fishes," the conclusion of which is reprinted here:

The observations described in this paper give a general idea of the gross chemical changes that take place in trout and perch during development and adult

life. After the eggs are laid, they absorb water. During the growth dependent on the utilization of stores of nourishment in the eggs, fat and nitrogen are used up, ash remains fairly constant, and the proportion of water increases. After a young fish begins to feed, its nitrogen increases somewhat, then remains more or less constant through adolescence and adult life. Fat also increases for a time but after the first year undergoes periodic seasonal fluctuations. As fat increases water decreases and *vice versa*. The increase in fat takes place during the summer, when water is warm and less dense, and when food is most abundant. In winter, when the water is cold and dense, and food is less abundant, fat decreases. Taylor (1922) has suggested that fat may serve a hydrostatic function in fishes—making them lighter by increasing when water is less dense and heavier by decreasing when water is denser—and the writer's observations on the seasonal fluctuations in fat support his view. However, no correlation between vertical distribution and amount of fat was found. This may be because other hydrostatic mechanisms, such as the swim-bladder, are more important in making adjustments to pressures caused by differences in depth.

Moulton (1923) maintains that the composition of animals should be compared on a fat-free basis and that, if this is done, "mammals show a rapid decrease in relative water content and increase in protein (nitrogen) and ash content from earliest life until the time of chemical maturity is reached. At this time the change becomes rather suddenly less, and nearly constant composition is shown."

In another paper (Pearse, 1924) an estimate has been made of the amount and variety of food used by certain fishes. It seems reasonable to assume that a fish consumes an amount equal to about 54 per cent of its own weight per day. Judging by consumption of certain foods that were analyzed by Birge and Juday (1922) and also fed to fishes by the writer, the caloric value of foods commonly consumed by fishes is considerably greater than their own. Until the basal metabolism of a fish has been determined at different temperatures it will not be possible to estimate the daily and annual caloric requirements of fishes with any accuracy. In summer a fish appears to eat enough to supply calories equal to about 15 per cent of the caloric value of its own body daily. If all the food is digested and its full caloric value utilized, which is unlikely, a fish has a high rate of "overturn" for its body substances.

There are various factors which limit the number of fishes that may exist in any body of water. The amount and quality of available food is important; also the average rate of overturn (rate of reproduction and length of life) of living food resources. Another important requisite is the ability and opportunity of the fishes to reproduce. The

number of adult perch in Lake Mendota, which contains 478,370,000 cubic meters of water, must be several millions (Pearse and Achtenburg, 1920, pp. 313, 314, 332). If these could find food and produce offspring without check the lake would soon be filled with perch. In April, 1921, the writer caught ten female perch and estimated the number of eggs. The average was nearly 10,000 for each. It is evident that there must be enormous losses between the laying of the eggs and the attainment of maturity. When scientists are able to make out actuarial tables for perch, rates of insurance will undoubtedly have to be high. The problems for those who wish to increase the yield of fish from aquatic habitats are evident: (1) Search for means to increase the amount, quality, and availability of food resources, and (2) discover how to make it possible for more fishes to survive to maturity and find favorable conditions for growth.

AREA ADDED TO SEQUOIA NATIONAL PARK.

The Barbour Bill has added 352 square miles to the Sequoia National Park, which now includes Mount Whitney, the stupendous canyon of the Kern, the Kaweah Peaks and the imposing mass of the Great Western Divide. In addition the adjoining Mineral King District has been created a game preserve.

What this will mean to the wolverine only time can tell. The wolverine, or "glutton," the largest of the weasel family, is now making its last stand in the southern Sierra. If there is a sufficient breeding stock left, it will find a necessary breeding ground in the added Kern-Kaweah watershed, where it will receive complete protection. It is significant that within this general region only eight wolverines have been trapped within the past few years.

It is also expected that mountain sheep, now practically confined to the main Sierra range on the Inyo side, will gradually return to their old range on the Kaweahs and Great Western Divide. It is hoped that hikers to Alta and Silliman may within a few years be afforded a sight of these now rare animals. The experience of park protection at Grant Canyon National Park makes it certain that the larger mammals will multiply in the added park area.

It has been suggested that the dry seasons are responsible for the marked increase among the wild life of the Sequoia National Park. The fawn crop at Giant Forest is above normal. Many does with twins have been feeding about the public camps. The does and bucks are so tame that they will eat from one's

hand. Grapes and melons seem to be the favorite food.

Bear are also numerous despite the fact that many must have drifted to slaughter outside the park last fall. Twenty-two bear, including six cubs, have been counted at the garbage incinerator.

KAIBAB FOREST TO BE OPENED TO DEER HUNTERS DURING OCTOBER.

Deer hunting on the Grand Canyon National Game Preserve in the Kaibab National Forest, Arizona, will be permitted during the period October 1 to 31, according to advice received by the California district headquarters of the United States Forest Service in San Francisco. Each person will be allowed one male deer, and hunters must have a government agreement and a state license before going to a hunting camp. Government agreements cost \$2.50 each, resident state licenses \$1.25 each and nonresident licenses \$20 each. Two checking stations, where agreements and licenses may be purchased, have been established at Ryan on the west side of the forest and at Kane on the east side.

The Kaibab National Forest was made a game preserve by President Roosevelt in 1906 and the game was protected from hunting, and an active campaign against their natural enemies, lions and wolves, was conducted by the Biological Survey. Under this protection the deer grew from a small herd of a few thousand very rapidly until in 1925 it was estimated that it contained between thirty and fifty thousand deer.

The opening of the forest for hunting was first made in 1924 and has been continued each year since. This has been done in an effort to reduce the herd, which was increasing so rapidly that the available forage was becoming exceedingly short and there was much danger that the herd would be exterminated by starvation. Furthermore, the foresters found that a great deal of damage was being done to reproduction and timber by the deer.

Those desiring further information regarding hunting on the Kaibab Forest should correspond directly with the Forest Supervisor, Kaibab National Forest, Kanab, Utah; the District Forester, Ogden, Utah, or the Arizona State Game Department at Phoenix, Arizona.

DR. JORDAN DISCUSSES FISH AND GAME CONSERVATION.

On the evening of Monday, July 26, Dr. David Starr Jordan addressed an enthusiastic audience at Monterey upon

the subject of "Preservation of Our Natural Resources." The address was illustrated by motion pictures, loaned for the occasion by Californians, Inc., and the Fish and Game Commission. Dr. Jordan, who is reputed to know more about fish than any other man in the world, warned the fishermen or "sportsmen" in his audience that the brook trout or "steelhead" (he asserts they are one and the same) in this locality are not nearly as numerous as they formerly were, and that overfishing may practically exterminate them in time, just as the passenger pigeons, once so prolific in the forests of the east and middle west, are now completely gone. The last one died last year. Chinook or King salmon, which abounds

The crude oil from tankers, Dr. Jordan asserted, is the curse of the Pacific coast. A national law should be passed to end this oil-dripping that annually kills untold thousands of sea birds, fish, clams—all manner of sea creatures and water birds, as well as enormous quantities of plankton, the more or less invisible creatures at the surface, on which many young fishes feed. Birds are destroyed mainly because their wings become saturated with oil.

Speaking of fishermen and hunters, Dr. Jordan divided them into two classes, "killers or hogs" and "sportsmen." The former are the ones who are a menace to the future of our natural resources.

Speaking briefly of the conservation of



FIG. 37. Black bears in Yosemite.

in Monterey Bay at certain times of the year, many of them going north to the Klamath or other colder waters to spawn, is the finest of all salmon. In the fourth year it reaches about 18 pounds weight. Then they spawn and die. All the five species of Pacific salmon, male or female, die after once spawning. A certain number may live to 6 or 7 years before spawning, these steadily growing, reaching in Alaska a weight of 60 to 80 pounds. As we have a greater number of species of fishes right here in Monterey Bay than occur on any other northern coast, we should take better care of them and see that conditions are in every way most favorable for their perpetuity.

deer, mountain goats, large birds such as the blue heron, that feeds on plant-destroying gophers, some owls, that eat grain-destroying field mice, and of ducks—the preservation of which is most difficult because of conflicting state rights as well as of misunderstandings of the work of the Biological Survey of the Department of Agriculture—Dr. Jordan ended his address with a plea for special protection of the little song birds, which devour yearly millions of mischievous insects.

ADVERSE FACTORS MENACING WILD FOWL.

In the July number of *The Oregon Sportsman* appears an interesting article



FIG. 38. Mountain lion treed and photographed by J. R. Hill of Covelo, Mendocino County.

by Edward W. Nelson, chief of the Bureau of Biological Survey, on "Our Migratory Wild Fowl," excerpts of which article are reproduced here:

There are apparently two great adverse factors directly menacing the perpetuation of our migratory wild fowl and these overshadow all others. One is the drainage of water areas by man, and the other is a succession of years of scanty rainfall, and its effect on a great area in the west, as indicated by the disappearance there of many ponds and small lakes.

In efforts to conserve the big game animals of the country it has been found that man has occupied most of their former wintering grounds, and the great conservation problem has been one of sufficient winter forage, the summer forage being usually abundant. In the case of migratory wild fowl, there is arising a like problem—that of maintaining sufficient water areas where the birds may feed during their migration and in winter, but there must be retained undisturbed breeding grounds, the basis of all wild fowl production.

The danger to the perpetuation of the stock of wild fowl is so great and so imminent from the causes mentioned that there is the most vital need for all conservationists and lovers of wild life to sink petty differences of opinion as to details and to unite in constructive work to insure the future of our migratory game birds.

Seventy-five years ago California had many hundreds of thousands of acres of lakes, marshes and grassy plains, where untold millions of ducks, geese and other migratory wild fowl found a winter paradise. With the increasing population of that state, the occupation and drainage of these areas has steadily progressed, until the great Tulare and Buena Vista lake basins and marshes in the San Joaquin Valley have become absolutely dry. Practically all the many ponds and lagoons which once occupied the coastal plains of southern California have been drained or filled and have disappeared forever.

Tule Lake, once a large shallow body of water, near the northern border of California, was formerly the winter home of myriads of ducks and geese, while many stayed there to breed. Forming as it does a part of a developing irrigation district, within the past few years it has been drained until now only an insignificant water area remains, forming a sink in the bottom of the old lake bed. The drainage of Tule Lake has been accompanied by some drainage of the neighboring Clear Lake, a federal bird reservation and still a great breeding ground for wild fowl.

The last great marsh area left in California is in the Sacramento Valley, but the water that hitherto has been used for flooding great marsh and rice-field areas in this valley must now be permitted to flow down the channel in order to main-

tain a navigable depth in the Sacramento River. This is a serious menace to this great area formerly available for migratory birds, and may be the culmination of adverse changes that have progressively destroyed one after another the homes of wild fowl in that state.

NEW TUNA BOAT TO BE CORK LINED.

Several years ago the Commercial Fisheries Department prophesied that attempts would soon be made to equip boats with refrigerating apparatus in order that fish might be landed in the best condition. At least three boats fully equipped are now transporting fish from Mexico to southern California ports. Within the last year, several boats have been especially built to facilitate icing the fish, but lacking refrigerating plants. Last fall a cork insulated boat was built at San Pedro and now M. O. Modena and J. A. Soares have ordered a similar cork insulated boat, according to the *Pacific Fisherman* (August 26, 1926). At first it was planned to equip this boat with an ice plant, but afterwards decision was made to use cork insulation. This boat, 110 feet long, will be one of the largest of the tuna fishing boats and will be manned by eight officers and men. Two-inch sheets of cork and asphaltum are utilized in the insulation. This cork insulation has been proved far superior to other insulation materials that have been tried out in past years.

THE ELIMINATION OF "HAFF SICKNESS."

Discovery of the cause of the mysterious "Haff sickness" which was proving ruinous to a large part of the German Baltic fisheries industry, together with the elimination of the disease virtually by government fiat, is announced at Berlin by officials. It is one of the very few cases on record where an edict had power to end an epidemic, or at least what looked like one.

A little over two years ago, fishermen in the stretch of shallow water along the southern end of the Baltic between Koenigsberg and Danzig, known locally as "the Haff," began to develop a very painful and in some cases fatal disease. Its symptoms were extreme pain and a kind of paralysis of some of the leg muscles, together with certain physiological disturbances. It always attacked its victims while they were out in their boats, and generally in the early morning while the mists still hung over the water. A few days on shore usually resulted in complete recovery, but a return to fishing might bring on repetitions of the malady.

In a short time the Haff fisheries were badly demoralized.

The theory that it might be an epidemic of a germ disease quickly went by the board. The "Haff sickness" had none of the earmarks of an ordinary epidemic. Likewise the theory that it might be caused by the eating of spoiled fish or eels had to be abandoned, because many of the victims did not eat fish, and fish-eaters on shore never suffered from the disease.

The investigators finally came to the conclusion that there must be something in the water that rose into the morning mists and caused the disease by poisoning the air. Research along this line soon showed that they were right. The disease was really a kind of arsenic poisoning, caused by the discharge into the water of great quantities of factory wastes from cities on shore. These wastes contained arsenic compounds, which were altered into gaseous form by small organisms living in the water, and thus released into the air to plague the luckless fishermen. The arsenic was present in the factory materials only as an impurity, so that it was no hardship to the industries when the government ordered them to change to the use of other materials with a lower percentage of arsenic. Within a few months the "Haff sickness" had virtually vanished.—*Science*, July 30, 1926.

H. P. SHELDON APPOINTED CHIEF U. S. GAME WARDEN.

Harold P. Sheldon, fish and game commissioner of Vermont, has been appointed by Secretary of Agriculture Jardine to be chief United States game warden of the Bureau of Biological Survey. He will fill the vacancy caused by the resignation of G. A. Lawyer, and will assume his new duties early in July.

The experience gained by Mr. Sheldon as state game commissioner of Vermont during the past five years well qualifies him for his new duties. He has been responsible for the administration of the fish and game laws of Vermont, also of the State Fish Hatcheries, the State Game Farm, and the Migratory Bird Sanctuary at Milton, Vermont. His name stood first on the eligible register, resulting from the civil service examination for the position.

As chief United States game warden, Mr. Sheldon will be in charge of the enforcement of two federal game laws, the Migratory Bird Treaty Act and regulations protecting birds migrating between the United States and Canada, and the Lacey Act regulating interstate commerce in game.

Mr. Sheldon is a native of Vermont, and before his appointment as state game commissioner was an assistant editor in the Office of Information of the Department of Agriculture at Washington. While in Washington after the war, he studied law and took special courses at both Georgetown and George Washington universities. He is author of many articles relating to fishing and shooting and the conservation of wild life. During the World War he served in France as first lieutenant in the 102d Machine Gun Battalion, and was later made captain. His services at the front were ended by a serious wound received in action, from which, however, he has fully recovered.

CHIEF U. S. GAME WARDEN SHELDON SAYS CONSERVATIONISTS ARE WINNING.

H. P. Sheldon, who recently assumed his duties as chief United States game warden of the Biological Survey, holds that the American sportsman is winning in his fight to conserve and perpetuate the wild game of the United States. As state game and fish commissioner of Vermont during the past five years, Mr. Sheldon has been in close touch with the activities of the many agencies cooperating in the work of game conservation, and speaks with a knowledge born of experience.

"A study of the present game situation in the United States," he says, "does not seem to warrant the pessimistic declarations we commonly hear. The melancholy atmosphere that some adopt when speaking of game conservation is an inheritance from the dark period in American game history when destruction was the rule, and when the scattered, unorganized sportsmen had not yet found the weapons with which to check it. That distressing period is definitely concluded and I sincerely believe that we are well forward in a new advance, which will be marked by constant increase in the numbers of our valuable species of fish, birds and animals."

The year 1960 will not offer to the individual the abundance of game that was available to the sportsman of 1860, but the future, he prophesies, will certainly provide a reasonable abundance of game to a greater number of sportsmen, if present policies and projects are consistently adhered to.

"Never before have the sportsmen and conservationists of America been so strongly and effectively organized; never before have the official agencies of conservation found such large sums of money at their disposal for advancing their work, and never before have we seen game and fish laws and regulations more generally supported by public approval than at the

present time. A glance at the game registers proves that the destruction of game that went on throughout the century just past has now been solidly checked, and that most species, particularly the migratory birds, are actually increasing. We are now able to count a profit where heretofore we have had to realize an annual loss. Slight though these gains may be, they represent the wide difference between victory and defeat. These gains indicate also that the policies and systems of game conservation, the legislative structures, and the educational and enforcement agencies that have been formulated after a century of conflicting opinion, narrow prejudice, apathy and ignorance, are right in their main principles and that we may safely expand them to increase future effectiveness.

I do not wish to assert that all obstacles are safely past. There are many to which the sportsman and his agents must apply the most powerful solvent that money, interest and cooperative effort and thought can distil. There is pressing need for antipollution laws, the training and employment of an adequate force of game protectors, provision for expanding the areas needed for the care and feeding of our increasing stock of game, the reduction of vermin, the study and control of disease, and the troublesome problem of harmonizing the rights of the landowner with the recreations of the sportsman who owns no shooting or fishing preserve.

These, and many other requirements, seen and unseen, must be met, but I believe that past accomplishments warrant us in regarding the future with confidence. We shall overcome our difficulties because we are at last beginning to comprehend the sense of the biblical instruction that 'a house divided against itself can not stand,' and that a safe, consistent, effective game conservation policy for America depends upon the submergence of personal discord. We require complete cooperation between the legislation of conservation and the science of conservation; between the state departments and commissions and the Federal Bureau of Biological Survey; between state and state, farmer and sportsman, and sportsman and warden."

Mr. Sheldon believes that the American sportsman, whose interest and support has made this progress possible, is entitled to the stimulation of quiet optimism as he prepares for the continuation of his effort to preserve and perpetuate our wild life.

PLOVER SEASON CLOSED BY FEDERAL REGULATION.

A continuous closed season has been prescribed throughout the United States on black-bellied and golden plovers, according to the Biological Survey of the United States Department of Agriculture, which is charged with the enforcement of the

Migratory Bird Treaty Act. Hunters are reminded by the bureau that persons killing these birds are subject to prosecution in federal court. Greater and lesser yellowlegs, however, may still be hunted legally during certain open seasons, which are as follows:

In Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Delaware, Maryland and Virginia from August 16 to November 30;

In the District of Columbia, North Carolina, South Carolina, Tennessee, Arkansas, Oklahoma, Texas, New Mexico, Arizona, California and Alaska from September 1 to December 15;

In Vermont, Pennsylvania, Ohio, West Virginia, Kentucky, Indiana, Michigan, Wisconsin, Illinois, Missouri, Iowa, Minnesota, North Dakota, South Dakota, Nebraska, Kansas, Colorado, Wyoming, Montana, Nevada and that portion of Washington lying east of the summit of the Cascade Mountains from September 16 to December 31;

In Utah, Oregon, Idaho, and that portion of Washington lying west of the summit of the Cascade Mountains from October 1 to January 15; and

In Georgia, Florida, Alabama, Mississippi and Louisiana from November 1 to January 31.

INTERNATIONAL CONGRESS HELD IN COPENHAGEN.

The Sixth International Ornithological Congress was held May 24-29, 1926, in the Danish Parliament Building in Copenhagen. Here were gathered ornithologists of many nations, scientists, explorers, big game hunters, and skin and egg collectors in great number.

The committee appointed to consider the protection of ducks reported, through Mr. Schioler, that they recommended a conference of nations immediately concerned, and that the governments should appoint delegates to draw up a report dealing with the conditions in their own countries. The committee considered it advisable that complete protection should be given during the period of pairing and migration, as well as during the actual nesting period.

It was firmly decided that bird protection must be international as well as national.—*Bird Notes and News*, Vol. 12, No. 2.

ECONOMIZE ON PINK SALMON.

A recent publication of the U. S. Bureau of Fisheries (Economic Circular No. 48) discusses red as against pink and

chum salmon. For a great many years only red meated kinds of salmon were canned, so that the public came to associate the color with the product. As a result, pink or pale-fleshed fish have been regarded with disfavor or suspicion. Even light-meated chinook salmon have not found a ready market. However,

They are low priced because of their abundance and the use of labor-saving machinery in handling and canning them. Their high protein content and lower color render them more economic than most animal foods in common use.

The same bulletin calls attention to the



FIG. 39. Learning to be a sportsman. Bruce Fleckenstein with honker goose and .410 shotgun. Photographed by C. I. Fleckenstein.

color is a matter of appearance only. Pink and chum salmon may be equally wholesome and mean certainly more economy. "Pink and chum" usually contain less fat but are equal to the red varieties in protein—tissue building mate-

rial. They are low priced because of their abundance and the use of labor-saving machinery in handling and canning them. Their high protein content and lower color render them more economic than most animal foods in common use.

Forty-four recipes for using pink and chum salmon are included in the bulletin.

CHEMICAL COMPOSITION OF PACIFIC COAST CRABS.

A bulletin by C. R. Fellows and C. T. Parks (Univ. of Wash. Publ. in Fisheries, 1, pp. 139-156) reports on the biochemical properties of the Pacific coast and Japanese crabs. The summary follows:

The proximate composition of raw and canned Pacific coast crab (*Cancer magister*) is reported for the first time. Analyses are also reported for the Japanese crab (*Paralithodes camtschatica*). Though totally unlike, these two species are remarkably similar in composition and food value. Very little variation in composition was found within the same species, except in fat content, which constitutently increases during the winter and early spring until the spawning and moulting season occurs. At this time the crabs become thin and watery and of less value as food.

The Japanese and Pacific coast crabs contained respectively 362 and 102 parts per billion of iodine—a very high figure.

The presence of struvite crystals ($Mg NH_4 PO_4 \cdot 6H_2O$) was demonstrated in the canned flesh of both of the species studied. This substance has been mistaken for glass by the public.

Fresh crab meat contains the active oxidizing enzyme tyrosinase which rapidly changes the color of the raw meat first to a dirty gray then to a deep brown color.

The blue discoloration often observed at the joints of the leg sections and at the muscle ends is not iron or copper sulfid, but probably results from a modified biuret reaction, resulting from the interaction of biuret (urea— NH_2) and copper, both from the blood of the crustacean, in the presence of ammonia.

The black discoloration in canned crab is iron sulfid due to the reaction of sulfur compounds from the flesh with iron from the container. A discussion of the discoloration reaction is given, together with suggestions for its suppression or retardation.

The use of quantitative indol, ammonia or bacteriological tests to detect spoilage in crab meat are unsatisfactory because such degradation changes as occur for many hours after death are entirely autolytic in character. So active in this autolysis, that crabs dead only ten hours show visible evidences of muscle disintegration accompanied by marked physical changes which make the flesh unsuitable for food. At a temperature of 65° F. crabs are suitable for food up to about six hours only.

Hydrogen sulfid in raw crab meat increases in amount only after about ten hours from death. There is a regular increase with time after ten hours at 65° F. and the presence of over two parts per million of hydrogen sulfid indicates decomposition has occurred.

The bacterial flora of raw crabs consists largely of cocci and members of the

colon-aerogenes group. Micro-organisms do not ordinarily penetrate into the flesh of crabs for from 20 to 36 hours after death. The body meat is infected first, the infection coming largely from the mouth and surrounding parts and the gills.

MARKED FISH RETURN.

An extraordinarily heavy return of marked salmon is astonishing all elements of the Columbia River fishing industry and is attracting the attention of fish scientists throughout the Pacific northwest.

The present catch of blueback salmon is featured by an unusual number of marked fish with the adipose and left central fins clipped. These fish are part of the 100,000 bluebacks marked at the Enterprise Hatchery and released in the spring of 1924, when they were already 18 months old.

Harlan B. Holmes, fish scientist with the federal bureau of fisheries, had collected the marks from more than 200 fish, Tuesday, and large numbers of the marked fish are still coming into the river. In some cases more than half of the bluebacks delivered to Astoria canneries bear the marks.

This is said to be by far the most notable return of marked fish resulting from any fish branding experiment ever undertaken in Oregon. It proves the efficacy of artificial propagation and the value of holding the young fish until they are a year and a half old before they are released.—*The Oregon Sportsman*, July, 1926, page 24.

SALMON MARKING EXPERIMENTS IN OREGON.

A series of salmon marking experiments, which have been conducted for a number of years on the Columbia River by the bureau in cooperation with the Oregon Fish Commission, yielded valuable information during the 1925 season. Approximately 100 adult chinook and 50 sockeye salmon, which had been marked by removing certain of their fins when they were liberated from the hatcheries, were recovered as they returned to the Columbia River to spawn. The sockeyes represent the first returns from 100,000 yearlings that were marked and liberated during February, 1924. The recovery of so large a number of three-year-olds gives promise of exceptionally good returns from the experiment. The fish in another sockeye experiment, in which the young fish were liberated during the fall of their first year, should have been five years old in 1925, but no returns were received.

This experiment seems to have been a total failure, as no three- or four-year-olds were recovered. These results agree with those from former experiments in showing that when it is not possible to liberate sockeyes in a lake in which they can remain until the spring of their second year (which is their natural time of migration), they should be held in rearing ponds until that time.

About 50 of the marked chinooks recovered were three-year-olds that had been marked at the Big White Salmon River Hatchery during May and June, 1923, when they were about five months old. Here, also, the recovery of a large number of three-year-olds gave promise of good returns as four- and five-year-olds. This one year's returns from this experiment nearly equal the total returns from two former experiments, which differed from this one mainly in that the fingerlings were retained for about three months longer before being liberated. The greater returns from this experiment would indicate that the best time to liberate the chinooks that spawn in the Little White Salmon and Big White Salmon rivers is during the spring of their first year. This is to be expected, for a study of the scales of the fish that spawn in those tributaries has shown that normally they migrate to the ocean within a short time after hatching.

In order to determine the best time to liberate fingerlings of the spring run of chinook salmon, a series of marking experiments was undertaken in 1925 at the McKenzie River Hatchery. This series consisted of five markings with liberations ranging from May of the first year to March of the second.

In addition to conducting the marking experiments on the Columbia River, H. B. Holmes has been making a study of the blueback salmon of the Columbia. Representative samples of scales and measurements were collected from the commercial catch at intervals throughout the season, and observations were made of the seaward migrants and the spawning adults in the Okanogan River spawning district.—*Bureau of Fisheries Document No. 1003*, by Willis H. Rich.

CORRECTION.

In the July, 1925, issue of CALIFORNIA FISH AND GAME, page 147 shows 106,275 pounds of bluefin tuna brought into California from Mexico via San Pedro. This should have been reported as yellowfin tuna, and added to the amount of yellowfin tuna brought into California from Mexico.

In the October, 1925, issue of CALIFORNIA FISH AND GAME, page 193 shows 33,406 pounds of bluefin tuna as brought into California from Mexico via San Pedro. This should have been reported as yellowfin tuna, and added to the amount of yellowfin tuna brought into California from Mexico via San Pedro.

In the April, 1926, issue of CALIFORNIA FISH AND GAME, page 115, there is shown 8225 pounds of bluefin tuna brought into California from Mexico via San Pedro. This amount should have been reported as yellowfin tuna and should be added to the amount of yellowfin tuna brought into California from Mexico via San Pedro.

NEW BULLETIN ISSUED ON GAME LAWS.

"Game Laws for the Season 1926-27," the twenty-seventh annual summary of federal, state and provincial statutes relating to game, has been compiled by Talbott Denmead and Frank L. Earnshaw, of the Biological Survey, and published as Farmers' Bulletin No. 1505-F by the United States Department of Agriculture. The outstanding information presented is the summary of laws relating to seasons, licenses, limits, possession, interstate transportation, and sale, for each state and province, in the form of detailed but concise synopses, which should be highly useful to thousands of sportsmen hunting in their own and other states.

Federal seasons on migratory game birds were changed during the year by amendments to the regulations respecting waterfowl and shorebirds, as follows: The open season on waterfowl, coots, gallinules and Wilson snipe was changed from the period September 16 to December 31 in Illinois, Indiana, Washington east of the Cascades, and Massachusetts in Nantucket and Dukes counties to the period October 1 to January 15, and in Kentucky to the period November 1 to January 31; in New Mexico and California the season was changed from the period October 1 to January 15 to October 16 to January 31. The season on doves was changed from the period September 1 to December 15 in South Carolina to October 16 to January 31. The open season on black-bellied and golden plovers was closed for an indefinite period.

Only eleven states have held legislative sessions since the bulletin on the game laws for the season 1925-26 was issued—Georgia, Kentucky, Louisiana, Massachusetts, Mississippi, New Jersey, New York, Rhode Island, South Carolina,

Virginia and Washington. The authors of the bulletin state that most of the changes during the year in the laws relating to game have been of minor importance except in Louisiana, Mississippi, Virginia and Washington, and that the most significant feature in connection with state legislation on game this year is the absence of provisions setting aside refuges for game animals or birds.

The game law bulletin is now being distributed to law-enforcement officials, conservationists, sportsmen and others as

an aid in the administration by the Biological Survey of laws protecting migratory birds and regulating interstate commerce in game. Copies of the bulletin can be had, as long as the supply lasts, on application to the United States Department of Agriculture, Washington, D. C. Hunters are urged to procure also copies of state game laws from their respective state game and conservation officials, a list of whom is given in the new bulletin.



FACTS OF CURRENT INTEREST.

The **Sardine Bulletin**, Fish Bulletin No. 11, which gives the result of years of investigation, is in press and will soon be ready for distribution.



Many of the state hatcheries have undergone extensive repairs during the summer and are in much better condition for fishcultural operations. The **Mt. Shasta Hatchery**, the largest of California's hatcheries, has received some much needed repairs and a number of new installations which will improve the output of this hatchery.



Nearly 4000 feet of new motion picture film has been purchased and assembled. The new reels are now available.



The eggs of the surf bird, one of the state's migratory shore birds, were discovered for the first time during the past summer in central Alaska by a party from the University of California.



Golden trout are again being reared in the **Mt. Whitney Hatchery**, eggs having been secured from the **Cottonwood Lakes Station**.



Owing to a change in the federal regulations the season on ducks will not open until **October 16**. State law closes the season on **January 15**, thus reducing the season from three and one-half to three months.



During the month of **August** the formal dedication of the **State Game Farm** and of the site of the new **Yosemite Hatchery** took place.



Large numbers of pheasants, raised at the **State Game Farm**, have been liberated in suitable locations during the past few weeks.

COMMISSION ACTIVITIES.

Department of Patrol.

Game Warden George Johnson, of Napa, recently took four residents of that section red-handed in the slaying of a spiked buck. Two of the party pleaded guilty to the charge before Justice Charles Snow and paid fines of \$150 each, and were sentenced to two years probation with the provision that they get rid of their dogs and discontinue hunting deer in this manner. A third member of the party was given a two-year probation sentence with a warning against use of dogs. The fourth, being under legal age, was given probation with the understanding that he hunt no more until the end of his term and get rid of his dogs immediately.

A few nights later, while driving along one of the Napa Valley roads, together with a "dollar-a-year" warden, Johnson saw still another alleged sportsman of that region shoot a deer focused in the glare of a spotlight. Johnson immediately put the gunner under arrest. He pleaded not guilty when arraigned before Justice Snow, and was placed in the county jail in default of \$50 bail.

Game Warden Jack Burke, of San Mateo County, recently undertook a stringent campaign against rabbit shooters in his district, one of the first fruits of which was the taking of an Italian resident of San Francisco. This party was seated on the fender of his automobile, shooting with a .410-gauge shotgun. When taken before Justice Griffin, of Redwood City, the hunter pleaded guilty and was fined \$50 for shooting from an auto, \$25 for having no license and \$25 for shooting rabbits.

A gunny sack and suit case containing thirty packages of "jerky" marked at \$1.25 per package proved the undoing of Henry Bristol and Evans McDonald, of Arcata, when they were apprehended recently by Game Patrolman McPherson Lough. Taken before Justice of the Peace Adams, at Arcata, Bristol entered a plea of guilty and was fined in the sum of \$100. McDonald, who is but 17 years of age, entered a plea of not guilty and his case was certified to the juvenile court of Humboldt County. The pair were traveling along a county road when overhauled by Patrolman Lough. The charge was a dual one of taking deer out

of season and of possession of deer meat in a closed season.

Bristol elected to spend 100 days in jail in lieu of the fine. McDonald was remanded into the custody of Sheriff Arthur A. Ross pending his trial.

An ultimatum in no uncertain terms was handed out to "game hogs" when Justice W. Hunt, of Mount Shasta, assessed fines totaling \$225 and suspended sentences of thirty days upon five parties charged with taking an over limit of trout. The arrests in these cases were made by Game Warden S. R. Gilloon, of Mount Shasta, who was patrolling the north fork of the Sacramento River in the vicinity of Weed and happened upon the five men, each claiming the legal catch of fish. Gilloon dropped down the road a few miles and paid the same party another call, this time finding them with thirty-five fish over the limit.

The entire party was conveyed into Mount Shasta, where they entered pleas of guilty to the charges against them and asked for a certain period of time to raise the money to pay their fines, which was granted.

Antone J. Anderson, of Crockett, California, entered pleas of guilty to two charges of illegal netting lodged against him in the court of Justice Ray Griffin, of Redwood City. He was assessed fines of \$100 each on the two counts and forfeited to our fish and game deputies two fine nets, each more than one mile in length and valued at about \$1,000.

One case has been pending against Anderson in the Redwood City court for more than a year past, or since Patrol Captain M. S. Clark, of San Francisco Bay District, and Patrolman Jack Burke, of San Mateo, charged him with use of an illegal net and of using it in an illegal manner. He was tried and the jury disagreed, but the game patrolmen only redoubled their efforts to catch him.

At 4 o'clock on the morning of April 28, 1926, after a vigil of more than twenty-six hours, Patrolman Burke and his son, George Burke, San Mateo high school student, caught Anderson a second time, again using an illegal net fastened to the shore in violation of the law.

Anderson at first elected to fight the second case, but later decided that Deputy Burke's evidence was too strong, and pleaded guilty.

Warden S. F. Gilloon, of Mount Shasta, arrested four Japanese in the act of killing doves and robins out of season. Judge H. I. Williams, of Cassel, assessed a \$100 fine against each man.

Captain William Lippincott arrested a man with five quail, taken out of season. Judge A. F. Ross fined the man \$100. Numerous other arrests have been made, and the deputies have received wonderful support from the local judges.

On the afternoon of August 16, Deputy C. L. Bundock, accompanied by Joe Maubert, Dick Pratt and Phil Hobson, three dollar-a-year deputies, came upon

should have been made to pay for such a gross violation of the law.

Department of Fish Culture.

A sum of money for the rehabilitation and enlargement of the famous Mount Shasta Hatchery, which has furnished California sportsmen with many millions of trout, has recently been allotted by the California Fish and Game Commission. The principal innovations will be: new hatchery buildings, a new and improved food-grinding and food-cooking plant, refrigeration plant, power plant, new walls for all the ponds, new screens and fishways.



FIG. 40. Deputies of the Fish and Game Commission visit the State Game Farm on March 7, 1926, and are introduced to the science of game propagation. Photograph by H. C. Bryant.

three men with 103 striped bass in their possession. The largest of these fish was nine inches in length, which is three inches below the legal limit.

The men were taken before Judge Wade Moore, of Pittsburg, who served a twenty-day suspended sentence upon them, on the plea that they were too poor to pay the fine. Two of the men were carpenters and the third a truck driver.

Such irregular procedure is neither fair to the sportsmen nor to the deputies, for it is undoubtedly most discouraging to work hard on a case and at the last moment to have it waived aside as a matter of no consequence. These men

When the large force of workmen now employed at the Mount Shasta Hatchery has finished its labors, the enlarged plant will be capable of increases of from 5 to 25 per cent in capacity. This season the plant is handling 200,000 brood fish, and will turn over to the fish planters something in the neighborhood of 14,000,000 fry this fall.

Four principal varieties of trout are propagated at Mount Shasta, the Loch Leven and German brown for the lower altitudes and warmer waters, and the famed California rainbow and eastern brook varieties for the higher altitudes and cold streams. Steelhead trout and

chinook salmon are likewise propagated here, and the resultant fry permitted to run to sea from the hatchery itself.

While the brood fish have largely been Loch Leven, German brown and eastern brook trout in the past, a considerable stock of rainbow brood fish is being collected at Shasta Hatchery under the direction of Captain G. H. Lambson. Captain Lambson has been in charge of the hatchery since 1919, prior to which time he was for many years in the employ of the Federal Bureau of Fisheries, as pilot of a fish distribution car, and still later in charge of the government hatchery at Baird, California. He is personally overseeing the improvements now under way, bringing to the project the results of his many years of training and study.

From a very small plant of seven ponds and one building, Mount Shasta Hatchery has developed to such an extent that it now comprises 52 ponds, 15 hatchery buildings, cottages for the superintendent and the permanent employees, a hydro-electric plant, a water plant and other appliances necessary for the propagation of young fish, especially constructed fish cars and tin cans used for distributing fry to the various planting centers.

With the increased facilities at its command, Mount Shasta Hatchery should, in the year 1927, be capable of handling about 250,000 brood fish, and producing at least 17,500,000 fry.

A total of 1,000,000 fingerlings, the product of the Bear Creek Hatchery, have been planted in the streams of San Bernardino County. A number of improvements, including a fish pond, have been added to the above hatchery.

A holding pond that will care for 100,000 fish has been built at the Fort Seward Hatchery, about 300 feet below the hatchery building. The fish in this pond will be held until late in the fall before they are planted.

About 100,000 trout are being held until fall in ponds at the Brookdale Hatchery. Another 150,000 will be placed in the ponds as soon as the fish are sufficiently mature.

During the month of June, the Mount Whitney Hatchery received 500,000 golden trout eggs from Cottonwood Lakes. This is about the normal take. The Rae Lakes station produced only 150,000 rainbow eggs, a total far short of that of former years.

Two hatcheries and three egg-collecting stations were operated in Plumas County. Low water was responsible for a less than

normal take of eggs. The take was smaller by 613,000 than that of last year.

The new plan of fish planting is now beginning to bear fruit. All sportsmen's organizations so far approached have endorsed the plan and there is not a single dissenting voice. In every possible instance captains of patrol have met the fish car and aided local sportsmen in their plantings. The result has been that there is less loss of fish this year than in previous years.

The experience with holding ponds maintained by sportsmen has not been encouraging. Even though funds were at hand for feeding and caring for the fish, this necessary duty was too often entrusted to untrained men with disastrous results. It is becoming more apparent that a holding pond can only function properly under the care of a trained fish-culturist. If this be true, holding ponds should be located at or near hatcheries so that careful supervision will be possible.

Department of Commercial Fisheries.

The albacore season was almost a failure. In order to secure fish, cannery offered \$210 a ton, but with poor success. Albacore were occasionally seen but could not be induced to take the hook, the only known practical manner of catching them. As a consequence, it is not to be inferred that the supply is depleted but that abnormal conditions existed which prevented the normal catch.

The catch of blue-finned tuna, however, was the best of any year with the exception of the year 1918. Skipjack were plentiful. Cannery consequently utilized these fish instead of albacore.

Likewise the salmon trolling season has been poor. Many fishermen having depleted their financial resources in unsuccessful search for fish, have had to secure loans and are deeply in debt. Owing to the small catches, the tagging work has been a great disappointment. It was hoped that a sufficient number of troll caught salmon could be tagged to assure evidence as to where these sea caught salmon go to spawn. So few have been tagged, however, that worthwhile results can hardly be expected.

The Pismo clam situation has claimed the attention of the department the past

summer. Local residents, noting depletion, are demanding prohibition of commercial digging but continuance of sale in local restaurants. If the commercial digger is responsible, the effective method is to stop all sale. However, there is much evidence to show that it is the tourist digger of clams who takes the largest toll. Past shipments and even past sales of Pismo clams have formed but a small portion of the total catch. Perhaps the most feasible method of giving this shellfish better protection would be the creation of a closed area to be set aside as a spawning refuge. If properly chosen, such an area would assure a breeding stock.

Plans are being matured for the gathering of statistics relative to the rock cod fishery at San Pedro, which plays an important part in supplying the market with fresh fish. The statistics will cover size, percentage abundance of each principal species in the catch, locality, gear and methods. Although the sardine work is engaging the attention of the laboratory staff, yet investigations of this kind carried along with the other work are insurance for the future.

Bureau of Education and Research.

During the past summer more than 50,000 persons heard wild life and conservation lectures in Yosemite National Park. Field trips gave intimate contact with vacationists and a chance to stir their interest in conservation. A wide variety of trips was offered by the nature guides, ranging from short two-hour trips to whole-day trips. Weekly trips to the back country constituted a real trail school.

Extension of summer resort educational work to California State Redwood Park marked another advance in the program. Attendance at the 24 lectures amounted to 16,800 and 1712 persons followed nature guides on the 65 field trips offered during the month of July.

Bureau of Pollution.

The director of the Bureau of River and Harbor Pollution reports that conditions as regards the pollution of rivers and harbors of California have improved materially in the past three months. The bureau, created since the reorganization

of the commission shortly after the first of the current year, has taken particular cognizance of cases of pollution by gas houses, oil wells, refineries and distilleries. Reports which have come in from virtually every section of the state have been investigated and remedial action demanded. In most cases this was forthcoming without the necessity for court action. In others it became necessary to file proceedings at law to force action.

Robert J. Irvine, a graduate chemist and bacteriologist, has been added to the staff of the pollution bureau. With his assistance a comprehensive analysis of all polluted waters is prepared for presentation to the proper authorities, upon which to base prosecution under section 635 of the Penal Code.

While conditions have greatly improved in recent months, there are numerous other cases and conditions in various communities that must be cleaned up before California waters can be said to be wholly safe for fish, plant and bird life. Those responsible for pollution are always given an opportunity to rectify conditions first. Failing in this the pollution bureau does not hesitate to take action.

Pollution of the waters of Hopper Canyon, in Ventura County, is to be stopped immediately, and every effort will be made to prevent a recurrence of conditions, according to a letter received by the Bureau of River and Harbor Pollution, from Hugh Grant, of the Julian Petroleum Company, Los Angeles. The Julian Company has large oil properties in the Hopper Canyon region, and conditions there were recently described as the most serious in the state.

All other sections of Ventura County having been freed of oil pollution, officials of the commission placed the Hopper Canyon matter before Mr. Grant in the light of a requisite of true sportsmanship, it being shown that fish were unable to live in the waters of the canyon below the properties of his company. In his letter Mr. Grant says: "I want you to know that I will give you my hearty cooperation along these lines, and I realize as a sportsman the value of the work you are doing."

From one of the worst polluted counties of the state, Ventura has risen to one of the cleanest.

Officials of the pollution bureau announce that this is generally true and they state that in the event of an accident, and the inadvertent dumping of

quantities of oil into California waters, officials of the offending company use every effort to clean up conditions as rapidly as possible.

Investigations at the "Bully Hill" Mine at Winthrop, California, operated by the California Zinc Company, showed that the plant was using an oil flotation method and cyanide in small quantities, the polluted mass of water and silt being allowed to run first into a settling basin, from which the water and oil were discharged into Squaw Creek. When conditions were called to the attention of Superintendent James J. Dugan and Foreman J. F. McDonald, these officials at once agreed to construct a new flume to carry all tailings from the mill across a considerable area and into a natural reservoir having no outlet into the creek.

About thirty days will be required to complete the new tailings disposal plant, following which the waters of Squaw Creek, from the mine to the junction of Pit River, will again become a splendid fishing stream.

Bureau of Screens and Ladders.

The Bureau of Screens and Ladders is installing a large map which will show the location of every screen and ladder in the state. A card index will record all of the details. Other pertinent data will be indicated on the map. As a result, there will be no recurrence of the former inadequate knowledge of the condition and location of screens and ladders.

During July, 45 screens and 15 ladders were inspected. In most instances the complete cooperation of owners has been secured.

Fish heretofore blocked from the upper part of the south fork of the Trinity River were offered a new, free passage this summer after dynamite had blown out a passageway through an old dam.

One of the first problems to confront the newly created Bureau of Screens and Ladders was an obstruction in the south fork of the Trinity River. The Little Klondike Hydraulic Mining Company has erected an artificial barrier, 30 feet in height and 100 feet long, thus closing the river completely to the annual run of steelhead trout and salmon, as well as to the rainbow trout, a fish which is a native to these waters.

After a series of conferences with offi-

cial of the company, and an appeal to their sense of true sportsmanship, they willingly agreed to open the obstruction, thus permitting the usual run of fish. This was accomplished on July 10, without recourse to law, and much to the delight of the sportsmen's associations and fishermen from all over California who frequent the Trinity River country in search of their favorite sport.

Another instance of the activity of the bureau is cited. In the Eel River, near Grizzly Butte in Humboldt County, a jetty was built some years ago to prevent erosion of the right bank. Unfortunately this interfered with the annual run of salmon and steelhead trout. Inasmuch as the jetty seemed now to be serving no purpose, Mr. Spencer, with the assistance of the Patrol Department, caused to be removed two large slabs of concrete, thereby clearing the hitherto obstructed stream.

Bureau of Game Farms.

Superintendent Bade, in addition to caring for the hatching and rearing of the many young pheasants, has been busy selecting suitable places to plant the output of the Yountville Game Farm. Several locations in the Sacramento and San Joaquin valleys have been found satisfactory, and young birds have been liberated. Redding and Stockton have both received shipments.

The birds at the farm have survived the hot weather (the temperature reached 109 degrees during the summer) because provision was made for their comfort. Oak brush was cut and placed in the cages for shade and the sprinkler system gave an effective means of reducing the temperature within the pens.

The first planting of pheasants from the State Game Farm took place on August 11 at Redding. A careful selection of a suitable locality had been made and a considerable gathering of sportsmen were at the station to meet the birds. A total of 231 birds, just ten weeks old, were shipped under the supervision of E. H. Lewis, assistant superintendent of the State Game Farm. Three different plantings were made in the bottom lands along the Sacramento River near Redding. Good food and splendid cover are available for the birds. Those present at the liberation were pleased to find that the birds were really wild birds and not domesticated ones. As soon as the ship-

ping boxes were opened, the birds immediately flew to cover.

Great interest taken in this plant by sportsmen of the vicinity insures rigid enforcement of the closed season. Successful results may only be expected under these circumstances.

Later in the fall numerous other plantings were made, notably a large one near Stockton. Although many of the birds planted this fall have been able to care for themselves, it is the plan to plant the birds when only two weeks old. The young pheasants are to be sent out with the mother hens and cared for by interested sportsmen on the ground where they are to be liberated. In this way, they learn the territory when they are young and quickly discover the food supply and learn the places of safety. This method will greatly facilitate the work of the game farm and increase the production.

The Southern Pacific Company has very

generously offered to transport, without charge, the pheasants from the game farm to the various points of distribution. Many birds, however, have been trucked to their destination.

State Lion Hunter.

Mr. Jay C. Bruce, state lion hunter, reports that eleven lions were killed during the six weeks ending August 31. During this time he has been hunting in the El Dorado National Forest between the north fork of the Mokelumne River and the Rubicon. On one occasion some of his dogs were badly mauled when a lion turned at bay and gave fight. Mr. Bruce's next trip will be to the country in the vicinity of the American River, where four lions have recently been reported.

LIFE HISTORY NOTES.

PREY OF THE VERSATILE RAINBOW.

Some years ago, while fishing in a small mountain stream in Plumas County, I landed an 11-inch rainbow trout whose greatly distended belly prompted an immediate investigation with my pocketknife. The operation disclosed a mouse-like creature which I first thought to be a shrew, but upon examination its disproportionately long hind legs and tail showed that it was one of the jumping mice. Being an adult specimen, it seemed rather large game for a trout of this size.

Upon another occasion I took from the same stream a much smaller rainbow whose stomach contained a ripe berry of the Western mountain ash (*Sorbus sitchensis*). The tree itself overhung the stream at a point a little above where the fish was lying, and there were many birds feeding upon the berries and knocking them from the branches. The fruit of this tree is coral-red and about a third of an inch in diameter, somewhat resembling a magnified salmon egg, but in this connection it is worthy of note that in seventeen years I have never known of a single case in which a salmon egg was successfully used as bait for trout in this particular stream.

Recently I opened the stomach of a rainbow trout thirteen inches in length which I had taken from the murky waters of the McCloud River, seven or eight miles above Baird, and was greatly surprised to find not only a 4½-inch sculpin

or "bullhead" (*Cottus shasta*) but also a young bird in the pin-feather stage. I was unable to identify the latter with certainty, but in size and general characteristics it resembled a young vireo.—W. I. Follett, Oakland, California.

SHRIKE ATTACKS YOUNG QUAIL.

Mr. James L. Ortega writes as follows:

"About 8 o'clock one morning while working in a prune orchard, about a mile and a quarter north of Yountville, Napa County, California, I heard a chirping noise very similar to the chirp of a young chicken. I noticed two birds on the ground some distance from me. The noise was proceeding from their direction. I noticed that one bird seemed to be larger than the other. The larger was flying at the smaller, which was dodging from side to side and chirping. This was in the orchard on bare ground and some distance from cover.

My curiosity was aroused, and I went near to get a better view. Then I noticed that the larger bird was a shrike, and the smaller a baby quail, scarcely able to fly. The shrike became alarmed at my near approach and flew up into a prune tree, whereupon the young valley quail started to run away from the spot where the shrike had attacked it. After running for a short distance it took to the air, rising to a height of a foot or so above the ground. After flying for a hundred feet or thereabouts it alighted and ran to cover, and so out of sight. I saw no

more of either the young quail or of the shrike.

Once before, several years ago, in 1919 or 1920, I noticed a shrike (in Merced County, California) trying to catch a very young chicken. The mother hen flew to and fro trying to drive the shrike away. However, I believe this is the first instance in my experience of a shrike attacking young quail. I did not see the beginning of this particular incident, so I do not know how the shrike got the little quail away from the cover of the weeds, so far into the orchard.

I do not intend this to be a condemnation of the shrike for I am fully aware of the fact that this bird does do much good in the way of catching insects; and I have even seen small mice and lizards hanging up in some favorite spot of a shrike. The lizard was of the fence lizard type, and was presumably one of the beneficial species.

The attack on the young quail was not provoked by lack of insect food, for in the adjoining field there were numerous grasshoppers of sufficient size to attract the attention of the shrikes."

With reference to the above observation, the following quotation will both confirm this and show to what extent this habit prevails: We quote from "Birds of California in Relation to the Fruit Industry," Bulletin No. 30, Biological Survey, U. S. Dept. of Agriculture:

"In the investigation of the food of the California shrike, 124 stomachs were examined. They were collected in every month, but the greater number were taken in the warmer months.

Vegetable food. Animal food of all kinds amounts to 97.5 per cent, or so nearly the whole that it is fair to suppose that the greater part of the 2.5 per cent of vegetable matter present was swallowed unintentionally—that is, when sticking to something else. All of it was contained in 9 stomachs. Fruit appeared in 2 stomachs, seeds in 2, and rubbish in 6. Of these probably only the fruit was taken as food. One stomach was filled with elderberries to the amount of 84 per cent of the contents, the other with the seeds of blackberries or raspberries to the extent of 13 per cent. It thus appears that the shrike sometimes eats fruit.

Animal food. The animal portion of the shrike's food may be divided into three parts: Insects, 83 per cent; spiders and a few snails, etc., 2 per cent; vertebrates, 12 per cent.

Of insects eaten by the shrike, the largest item is Orthoptera—that is, grasshoppers and crickets—which amount to nearly 43 per cent of the whole food. They are eaten in every month of the year, and in August and September reach nearly 70 per cent. These are the normal

grasshopper months, the ones in which eastern birds enjoy their annual grasshopper feast. Ordinary grasshoppers form the greater part of this item of food, but a good many crickets are eaten, especially the brown and striped so-called wood crickets.

Vertebrates. The vertebrate part of the shrike's food amounts to a little more than 12 per cent, and consists of the remains of small mammals, birds and lizards. Mammals were found in 4 stomachs, birds in 2, and lizards in 12. Neither of the birds could be identified further than that both were small song birds. Of the mammals, one was a pocket mouse (*Perognathus*), one a young field mouse (*Microtus*), and one a shrew (*Sorex*). The fourth mammal could not be identified, as there was little left except hair. The lizards were not recognizable either generically or specifically, as the remains consisted only of bones and scales. From an economic standpoint, lizards are useful animals, as they subsist on insects. The same is true of birds, so that in destroying birds and lizards the shrike is doing harm. Fortunately, it does not eat many birds. The destruction of the mammals is an unmixed blessing, except, perhaps, in the case of the shrew (*Sorex*), which is largely insectivorous. Even if all the above vertebrates were useful the score against the shrike would not be a very heavy one and would not outweigh the value of its services in destroying grasshoppers. In the writer's field experience with the shrike only one attempt to capture a vertebrate animal was observed. In this case the shrike was seen to plunge into a thicket of weeds in pursuit of a brood of tiny quail, but a few seconds later it emerged in a great hurry, closely followed by the irate cock quail. As a matter of fact, the noxious mammals eaten both by the eastern and western shrikes far outnumber the birds, and when to the former are added harmful insects the balance is very largely on the credit side."—H. C. Godsil, Berkeley, California.

GRAY SQUIRREL DISEASE STILL EXISTS.

The serious epidemic of 1920-1921 so effectively reduced the number of gray squirrels that in the intervening years the species has not had an opportunity to recuperate. For instance, in Yosemite Valley, where gray squirrels were once very abundant, but two or three have been seen in the past two years. No doubt the species will eventually return to normal numbers, but continued protection is needed. One reason for the slow increase in numbers may be found in the fact that the disease is still prevalent in some places. A recent report from Twain, Plumas County, made by W. I. Follette, is to the effect that early

last summer a dead gray squirrel was discovered a few miles east of the McCloud River in Shasta County. Its head, particularly about the eyes and snout, was covered with scab and gave every evidence of the same disease which made such inroads a few years ago.—H. C. Bryant, Berkeley, Cal.

YOUNG ANTELOPE RESCUED.

One day last May a baby antelope

wandered into the town of Mount Hebron with his nose full of porcupine quills. Some men found him and succeeded in ridding him of the quills. In that the animal was hardly capable of taking care of himself, he was kept in captivity for a time. The accompanying photograph shows the animal while in captivity.—Wm. Lippincott, Yreka, California.

CONSERVATION IN OTHER STATES.

OREGON COMMISSION ABLE TO CLOSE STREAMS.

The Oregon Fish and Game Commission has plenary powers and consequently is

premises, the Oregon commission promptly closes the area to all fishing and the owners are also deprived of the privilege. Soon there is a change of heart and a



FIG. 41. A young antelope, rescued near the town of Mount Hebron, Siskiyou County, and reared for some time in captivity. Photograph by Wm. Lippincott.

able to protect young fish in the streams. After planting tributary streams, these streams are closed to fishing until the planted fish have attained proper size. With the same authority the commission is able to mark a portion of a lake with buoys and make it a fish refuge. It is a common thing in Oregon to find one part of a lake open to fishermen and another part closed. This assures a breeding stock being left in the lake after the angling season. When private landholders refuse to allow fishing on their

request for the opening of the area to fishing. California needs similar discretionary powers to adequately care for natural resources.

STREAM POLLUTION IN OREGON.

In November, 1925, the Oregon State Game Commission initiated a movement to prevent further pollution of the streams of this state. Notice was served on all the cities and towns discharging their raw sewage into streams that they would be expected to plan immediately for the

installation of sewage disposal plants. Towns without present sewer systems were advised that as they constructed new sewers they would be expected to comply with the law and provide adequate sewage disposal plants.

In furtherance of this program there was recently formed in Portland the Oregon Anti-Stream Pollution Committee. This is composed of representatives from the State Board of Health, the State Game Commission, the State Fish Commission, the Salmon Protective Association, the State Sportsmen's Association, the Multnomah Hunters and Anglers Club, the Association of Engineers of Willamette Valley Cities and the United States Bureau of Fisheries. This organization is now actively engaged in backing up the game commission in its efforts to prevent the towns of Milwaukie and West Linn from installing new sewer systems which will discharge raw sewage directly into the Willamette River. The Attorney General has been asked to enjoin these towns from proceeding with their construction work until their plans provide for the proper treatment of their sewage.

It is thought by the members of this state wide committee that it is illogical to permit further pollution of the Willamette River at a time when the cities of Eugene, Albany, Salem and Portland are taking active steps to undo the harm that has already been done. These cities are all considering the installation of modern sewage disposal systems just as rapidly as their plans can be worked out and finances become available.

Following out the recommendations of H. B. Hombon, sanitary engineer in charge of United States Public Health Service at San Francisco, the State Board of Health is conducting a series of tests in the Willamette River from above the city of Eugene to the city limits of Portland. Similar tests are being conducted by Portland in the Willamette River within the city limits. The Oregon Anti-Stream Pollution Committee is cooperating with the State Board of Health in this work. If the results of these tests show that the health of the citizens is being menaced by the pollution of the river the work of changing the sewer systems along this stream will be greatly hastened.—*The Oregon Sportsman*, July, 1926, page 8.

MASSACHUSETTS GAME FARM ADOPTS NEW SYSTEM.

Massachusetts has recently adopted the method of pheasant propagation utilized by the English breeders. Birds are con-

trolled by the use of the brail. The brail is a Y-shaped piece of leather or rubberoid, and is riveted around one wing in such a way as to prevent flight. The device will permit carrying large numbers of birds in open pens, whereas the work heretofore has been confined to covered pens. The result will be more economical operation, and the production of a stronger and better bird by reason of the greater freedom and variety of food made possible by the larger range. It has been found that on removal of the brail the bird has full use of its wings. The brail is occasionally shifted from one wing to the other. It has the advantage over the method of clipping the flight feathers, in that the bird is in condition for liberation at any time should this become desirable.

OREGON SUCCEEDS WITH HUNGARIAN PARTRIDGES.

It has taken many years of experimentation to attain success in propagating Hungarian partridges. Perhaps the best results yet obtained may be credited to the Eugene Game Farm in Oregon. Six hundred birds were reared during the past season. Success is credited to the method of holding birds sufficiently long to acclimate and domesticate them. California has been promised some of the breeding stock.

MONTANA REPORTS ACTIVITIES.

According to the 1923-24 report of the Montana Fish and Game Commission, this state is stocking its streams heavily with the Loch Leven trout. Through an exchange with the Oregon Fish and Game Commission, Montana will secure 2,000,000 eggs, and 3,000,000 more are to be secured from the United States Bureau of Fisheries. One section of the Missouri River is becoming a rival of the Madison River as a Loch Leven and rainbow stream.

Attention is called to the need for protection for fur-bearing animals. Martens are nearly extinct and other species need better protection.

The educational campaign is beginning to show results. Many people who were living their lives without thought or interest in the Montana Fish and Game Department except to secure the greatest possible returns for the money paid for the hunting and fishing licenses, are now giving time, constructive thought and service to the sportsmen's program. Another result is to be found in the desire generally manifested to acquire a true knowledge of all the facts pertinent to efficient game management.

CANADA TO PROTECT ANTELOPE.

In line with efforts being made in the United States to give better protection to the prong-horned antelope, Canadian provinces are undertaking to save from extermination the antelope within their jurisdiction. The game commissioner of Saskatchewan is striving to educate and interest the people of that province in antelope conservation and is stressing law enforcement.

MISSOURI PLANTS GRAIN IN STATE REFUGES.

Crops of corn, clover, oats, cow peas, millet, rutabaga, alfalfa, sunflower and soy beans have been planted in Missouri game refuges to furnish food for wild game. All tillable land in adjoining sanctuaries is being used. Although a portion of the grain will be harvested for use in winter feeding, yet most of it will be left standing as a source of food supply for game within the refuges.

MONTANA PLANTS DUCK FOOD.

Indictment that state game authorities devote their time and attention solely to police work can not hold against the State Game and Fish Commission of Montana, as that state is actively engaged in planting the marshes frequented by waterfowl with all varieties of duck food plants.

At a recent meeting of the Western Montana Fish and Game Association held at Missoula, Chairman Thomas N. Marlowe of the State Game and Fish Commission told the sportsmen present what had been done in this respect during the recent months. He stated that \$2,700 had been spent during May for duck foods which were being planted in the lakes and reservoirs of the Flathead Valley along the Flathead Lake and in the Kalispell district. This was to be followed by plantings in all the lakes and ponds in other parts of the state where such plants will thrive.

Experiments have been conducted during the past year to show what plants are best suited to different localities.

Montana has also made some large importations of Hungarian partridge from Europe which have been liberated in various sections of the state during the past spring. It is constructive work of this character which brings results in more sport and better shooting.

MISSOURI HAS UNIQUE LAW.

Protection for spawning fish in Missouri depends upon a season from April 10 to June 1, when it is illegal to use artificial bait of any description. This law

was designed as a protective measure for stream fish during the spawning season. Apparently the emphasis on artificial bait does not preclude the use of natural bait, which most anglers claim is the more destructive of the two methods.

WISE INVESTMENT BY WISCONSIN.

The state of Wisconsin, through its conservation commission, has recently made possible an emergency appropriation of \$90,900 for the purpose of developing and protecting the natural fish spawning grounds of the Mississippi River.

The use of the commission's reserve funds for specific conservation work has been authorized by the emergency board, consisting of the governor, secretary of state and state treasurer. Much of the amount is to be devoted to fish propagation activities.

Numerous desirable spawning grounds along the Mississippi River have been selected for the purpose of "developing the greatest fish propagation ponds in America," according to Conservation Commissioner Hall, and \$20,000 of the emergency appropriation is to be used for the acquisition of new hatcheries in that territory.

The brook trout hatchery at Westfield is to be enlarged, and the emergency appropriation also contemplates \$25,000 for additional conservation warden service and \$40,000 for equipping additional forest fire districts.

The federal government is acquiring bottom lands for the new Upper Mississippi River Wild Life and Fish Refuge, and it is the aim of the Wisconsin commission to preserve suitable spawning grounds for fish propagation by the state.

The sloughs and ponds along the upper Mississippi are regarded as the best bass breeding grounds in America, and millions of small fish have been rescued from the shallow landlocked waters annually by the United States Bureau of Fisheries and the state departments of Wisconsin, Iowa, Illinois and Minnesota for restocking lakes and streams.

MICHIGAN CLOSES GROUSE HUNTING FOR YEAR.

Following closing of partridge shooting in certain counties of Michigan last year, the State Conservation Commission has issued an order closing the entire state this year. This action is in line with the recommendation of the American Game Protective Association that during the prevailing scarcity of ruffed grouse close seasons be invoked to prevent destroying all the brood stock.

The shortage of ruffed grouse in some states is really alarming and great care should be exercised to preserve what few birds there are, otherwise their restoration will be indefinitely delayed. The region of the most serious losses from disease, or whatever may have been the cause of the sudden disappearance of the partridge, seems to include Minnesota, Wisconsin and Michigan. In the east the situation is not so serious, as many localities report an increasing number of birds. It is possible that New York, Pennsylvania and New England may be recovering from the grouse malady, while it appears to be at its peak farther west.

The Grouse Investigation Committee is carrying on its researches through the work of Dr. Allen of Cornell University and Dr. Gross of Bowdoin College and other scientists, and important facts are being brought to light. The committee needs more financial support, however, that its work may be carried to completion.

MISSOURI INCREASES HATCHERY FACILITIES.

Upon the completion of the present program, Missouri will have doubled the

number of her hatcheries. Five new hatcheries are now in process of construction. These will augment the four hatcheries now in operation. Missouri boasts of the second largest pond culture hatchery in the United States. As is so often the case, great difficulty was experienced in securing suitable locations. A location free from flood water, soil that will hold water, and suitable drainage conditions, in addition to an appropriate and economic water supply, are essential requirements. The new hatcheries will be used for the propagation of bass, crappie, goggle-eye and blue-gills.

MISSOURI INTRODUCES WHITE-TAILED DEER.

A sum of \$2,500 was recently appropriated by the Missouri Fish and Game Commission to be invested in Virginia deer for stocking game refuges. Fifty deer were procured on the basis of one buck to two does from a 13,000-acre preserve on Grand Island in Lake Superior. Fifteen additional animals are to be secured for the Taney County game preserve. Missouri, like Pennsylvania, surrounds her refuges with a single strand of smooth wire.



REPORTS.

Violations of Fish and Game Laws.

GAME CASES.

April-May-June, 1926.

	Number Arrests	Fines Imposed	Jail Sentences (days)
Violations of Hunting License Act.....	4	\$90 00	---
Deer: hunting, killing, possession, closed season.....	10	700 00	210
Deer: killing, possession; does, fawns, spike bucks.....	3	250 00	180
Ducks: killing, possession, closed season.....	6	25 00	150
Geese: killing, possession, closed season.....	2	---	---
Doves: killing, possession, closed season.....	4	85 00	---
Wild pigeons: killing, possession.....	4	125 00	30
Quail: killing, possession, closed season.....	7	245 00	---
Pheasants: killing, possession.....	1	25 00	---
Night hunting.....	1	25 00	---
Rabbits: cottontail-brush; killing, possession, closed season.....	14	335 00	30
Squirrels: killing, possession.....	3	75 00	---
Shooting game from automobile.....	3	70 00	---
Non-game birds: killing, possession.....	2	35 00	---
Game Refuge: hunting, possession of firearms.....	1	25 00	---
Totals	65	\$2,110 00	600

FISH CASES.

April-May-June, 1926.

	Number Arrests	Fines Imposed	Jail Sentences (days)
Violations of Angling License Act.....	26	\$550 00	40
Violations of Commercial Fishing License Act.....	3	60 00	---
Trout: closed season or closed district.....	28	1,140 00	---
Trout: over bag limit.....	15	350 00	50
Trout: taken other than with hook and line.....	8	150 00	---
Striped bass: overlimit, undersized.....	5	110 00	---
Striped bass: shipment out of state.....	2	200 00	---
Crabs: selling meat out of shell.....	8	125 00	---
Crabs: transporting from District 14.....	6	850 00	---
Crabs: female, possession of.....	1	---	---
Clams: closed season.....	1	25 00	---
Clams: undersized, overlimit.....	1	50 00	---
Abalones: undersized, overlimit.....	56	1,565 00	---
Salt water perch: sale, closed season.....	1	25 00	---
Salt water eels: undersized.....	1	25 00	---
Barracuda: undersized.....	2	45 00	---
Spotfin croaker: offering for sale.....	1	25 00	---
Black bass: closed season.....	4	100 00	---
Black bass: undersized.....	2	45 00	---
Sunfish: closed season.....	5	60 00	30
Shad: overlimit.....	3	60 00	---
Illegal night fishing.....	4	100 00	---
Game fish: taken other than with hook and line.....	5	50 00	150
Illegal fishing: 250 feet of fishway; 150 feet of lower side of dam.....	8	175 00	---
Nets, set lines: illegal possession or use.....	26	2,985 00	---
Pollution of streams.....	2	---	---
Totals	224	\$8,870 00	270

SEIZURES OF FISH AND GAME.

April-May-June, 1926.

Ducks	5	Catfish	3
Doves	4	Shad, pounds.....	340
Wild pigeons.....	3	Salmon, pounds.....	48
Quail	7	Barracuda, pounds.....	1,619
Non-game birds.....	1	Spotfin croaker, pounds.....	132
Deer meat, pounds.....	50	Salt water perch, pounds.....	22
Rabbits	37	Pismo clams.....	35
Squirrels	3	Crabs	1,945
Trout	767	Crab meat, out of shell, pounds.....	10
Striped bass, pounds.....	1,166	Abalones	135
Black bass	5	Nets	10
Sunfish	35		

CALIFORNIA FISH AND GAME.

STATEMENT OF INCOME.

For the period April 1, 1926, to June 30, 1926.

License sales:	Detail	Total
Angling	\$87,256 00	
Hunting	67,958 00	
Market fishermen's	20,960 00	
Trapping	497 00	
Wholesale fish packers' and shell fish dealers'	100 00	
Game breeders'	67 50	
Fish breeders'	25 00	
Total license sales		\$176,863 50
Other income:		
Court fines	\$10,436 75	
Fish packers' tax	38,010 40	
Fish tag sales	1,148 14	
Game tag sales	7 18	
Miscellaneous sales	25 00	
Abalone inspection	88 65	
Interest on bank deposits	567 53	
Total other income		50,283 65
Total income		\$227,147 15



STATEMENT OF EXPENDITURES.

For the Period April 1, 1926, to June 30, 1926, of the Seventy-eighth Fiscal Year.

Function	Materials and supplies	Salaries and wages	Service and expense	Property and equipment	Total
Administration:					
Commissioners.....	\$3 37		\$33 13	\$12 60	\$49 10
Executive and legal.....	56 79	\$2,126 16	387 63	346 36	2,916 94
Clerical and office.....	26 59	5,182 16	271 07	689 85	6,169 67
Rent.....			1,705 43		1,705 43
Printing.....	2,267 85				2,267 85
Postage.....			547 62		547 62
Freight, cartage and express.....			407 21		407 21
Telephone and telegraph.....			1,177 62		1,177 62
Automobiles.....	172 75		59 55	123 99	356 29
Accident and death claims.....			3,101 75		3,101 75
Total administration.....	\$2,527 35	\$7,308 32	\$7,691 01	\$1,172 80	\$18,699 48
Publicity and research:					
Director of education and research.....	\$50 16	\$1,381 45	\$192 10	\$903 50	\$2,527 21
Director of publicity.....	6 79	1,061 88	99 71		1,168 38
Printing.....	2,631 50				2,631 50
Total publicity and research.....	\$2,688 45	\$2,443 33	\$291 81	\$903 50	\$6,327 09
Conservation and protection:					
(Patrol and law enforcement)					
Chief and assistant.....		\$1,849 98	\$177 38		\$2,027 36
Captains and deputies.....	\$578 91	32,298 99	25,749 38	\$480 00	59,107 28
Patrol launches.....	287 79	310 00	306 75		904 54
Clerical and office.....	3 83	1,770 00			1,773 83
Rent.....			80 64		80 64
Automobiles.....	269 74		83 81		353 55
(Protection)					
Lion hunting.....		375 00	275 96		650 96
Lion bounties.....			1,550 00		1,550 00
Total conservation and protection.....	\$1,140 27	\$36,603 97	\$28,223 92	\$480 00	\$66,448 16
Commercial fisheries:					
Chief and assistants.....	\$58 01	\$1,830 00	\$360 27		\$2,248 28
Deputies.....	18 98	3,312 00	808 41		4,139 39
Laboratory research.....	641 30	4,662 72	965 05	\$562 76	6,822 83
Statistical.....	405 70	1,110 00	18 41		1,534 11
Patrol launches.....	422 30	442 26	155 56	5,838 46	6,858 58
Salmon tagging.....	800 00		72 65		872 65
Total commercial fisheries.....	\$2,346 29	\$11,356 98	\$2,371 35	\$6,401 22	\$22,475 84
Game propagation:					
Game farm maintenance and operation.....	\$2,093 67	\$1,656 08	\$1,034 37	\$1,701 75	\$6,485 87
Additions and betterments.....				9,959 03	9,959 03
Total game propagation.....	\$2,093 67	\$1,656 08	\$1,034 37	\$11,660 78	\$16,444 90
Fish culture:					
Chief of division.....		\$950 00	\$75 28		\$1,025 28
Special field investigations.....	\$122 18	2,400 00	699 49	\$842 38	4,064 05
Clerical and office.....	43 52	915 00	6 80		965 32
Hatcheries maintenance and operation.....	17,741 42	23,113 30	2,562 07	987 44	44,404 23
Hatcheries additions and betterments.....				9,587 97	9,587 97
Automobiles.....	743 17		310 33	2,243 02	3,296 52
Rent.....			17 00		17 00
Total fish culture.....	\$18,650 29	\$27,378 30	\$3,670 97	\$13,660 81	\$63,360 37
License commissions.....			\$15,588 10		\$15,588 10
Total expenditures.....	\$29,446 32	\$86,746 98	\$58,871 53	\$34,279 11	\$209,343 94

CALIFORNIA FRESH FISHERY PRODUCTS FOR MONTHS OF APRIL, MAY AND JUNE, 1926.

Compiled by Fish and Game Commission, Department of Commercial Fisheries.

[illegible]

INDEX TO VOLUME 12.

A

Abalone, 51, 115, 149, 159, 215.
 Abbot, C. C., 137.
 Abbott, Fred, 90.
 Abels, Henry J., 31.
 Abrew, Tony A., 84.
 Accidents, hunting, 1925, 83-86; hunting, data, 1924-25, 87.
 Adams, Wm. C., 33.
 Alabama, introduces forestry into the public schools, 46.
 Albacore, 15, 45, 50, 105, 114, 158, 201, 214; patrol boat gets new engine, 106.
 Alcares, Jose R., 81.
 Alders, Ed., 22.
 Alewife, 65.
 Alkali poisoning, ducks die from, 32.
 Allen, A. A., 41, 209.
American Forests and Forest Life, 46.
 American Game Protective Association, 33, 41, 186, 208.
 American Humane Association, 140.
 American Reclamation Society, Inc., 41.
 American Museum of Natural History, 137.
 Anadromous, 59.
 Anchovy, 20, 50, 114, 158, 214.
 Anderson, Antone J., 199.
 Anderson, E. W., 154.
 Andrus, Wm., 85.
 Angler, 67, 69, 70, 71, 72, 95, 141.
 Anglin, Thomas C., 181.
 Animal, fur-bearing, 43, 109, 141, 207; humane capture of, 140-141.
 Animals, wild, sanctuary proposed for in Southern Africa, 42.
 Annelid, 67.
Anopheles, 136.
 Antelope, 35, 82; reports on, favorable, 108; young, rescued, 206; Canada to protect, 208.
 Prong-horned, 208.
Aphriza virgata, 186.
Aquila chrysaetos, 153.
Arkansas Conservationist, 153.
 Associated Sportsmen's Clubs of California, 33, 92, 99, 147.
 Atherinidæ, 162.
 Atherton, G. H., 80.
 Atwood, Leon, 142.
 Auble, E. F., 140.
 Audubon society head lauds sportsmen's organizations, 186.
 Aviary, 179.
 Avocets, stilts and phalaropes, food of, 41.

B

Babisuri, 78.
 Bade, August, 12, 31, 80, 103, 148, 181, 203.
 Badger, 78.
 Bag limit, the real sportsman and the, 39; piecing out, 83; federal reduced, 98; exceeding, 140; duck, federal power and, 185.
 Bailey, F. M., 180.
 Bait, 71.
 Barge fishing on the southern California coast, 19, 20.
 Barnhart, S. N., 140.
 Barpholm, G., 85.
 Barracuda, 17, 20, 45, 50, 114, 134, 149, 153, 214.
 Bartels, R., 85.
 Bass, 20, 43.
 Black sea, 50, 114, 158, 214.
 Rock, 50, 114, 158, 214.
 Sea, 56, 134.
 Striped, 51, 101, 102, 115, 159, 200, 214; in California, 55-74; number of, 79; plan determination of age and rate of growth, 79; trout tackle for, 79; and salmon investigations, 146.

White sea, 17, 50, 105, 158, 166, 214.
 Winter, 59.
Bassariscus astutus raptor, 77.
 Bat, Mexican Free-tailed, economic value of, 135-137.
 Bauder, C. S., 101.
 Beal, F. E. L., 180.
 Beall, Ernest, 85.
 Bear, 91, 188.
 Beaver, rapidly exterminated in Oregon, 93; in Modoc County, 152-153; disappearing in San Joaquin Valley, 187.
 Beetle, 39.
 Bernstein, Carlos E., 81.
 Bibliography, 74.
 Bird, migratory, 191; economic value of, 1-8; California game, enjoy winter in Alaska, 40-41; banding, real results in, 90; study contest, Sonoma County schools hold, 90-91; migratory insectivorous, are the farmers' friends, 92; black powder used to frighten, 97; house colony, 130-133; predatory destruction of, 137-139; protection in Switzerland, 154-155.
Bird Notes and News, 155, 193.
 Bittern, 155.
 Blackbird, Brewer, 6.
 Blakely-Bliss, Dorinda, 142.
 Bloch, Emile, 85.
 Bloodworm, 72.
 Bluebird, 130, 131.
 Bluefish, 50, 114, 158.
 Blue-gill, 209.
 Boat, new tuna, to be cork lined, 191.
 Bobcat, 43.
 Bobwhite, 12, 169; San Benito County receives Mexican, quail, 140.
 Boccaccio, 50, 114, 158.
 Bonito, 20, 50, 114, 158, 214.
 Bonnot, Paul, 146.
 Booth, F. E., 16, 17.
 Botanical garden, new, 142.
 Bouton, Charles, 146.
 Bowen, Ed., 66.
 Boy Scout, 94.
 Bragg, G. H., 80.
 Brail, 207.
 Brandenburg, Orayne, 85.
 Brant, 98.
 Breakenridge, Harold, 85.
 Brewster Medal, 35.
 Bristol, Bert, 89.
 Bristol, Henry, 199.
 British Columbia, tries acclimatization experiments, 46.
 Browning, 22.
 Brownlow, O. P., mountain sheep taken captive, 106-107.
 Bruce, Jay C., 149, 204.
 Bruere, Samuel, 84.
 Bryant, Harold C., 55, 74, 104, 143, 147, 179, 180, 181; economic value of birds, 1-8; California's new state game farm, 10-13; striped bass in California, 55-74; investigations of deer disease in Mendocino County, 107-108; reports on antelope favorable, 108; life history and habits of the western mourning dove, 175-180; gray squirrel disease still exists, 205-206.
 Buche, 166, 168, 169.
 Buck, 36, 47, 125, 127, 151, 154, 173, 185, 188, 209.
 Pacific, 127.
 Spike, 185.
 Buffalo, 35; once native of California, 186-187.
 Bullard, F. A., a horned doe, 47.
 Bullard, Roy, 47.
 Bullhead, 73, 204.
 Bundock, C. L., 182, 200.

Bureau of Education and Research, 30, 147, 202.
 Finance and Accounts, 30, 147.
 Game Farms, 31, 147-148, 203-204.
 Publicity, 30, 101, 147.
 River and Harbor Pollution, 99, 103, 147, 154, 202-203.
 Screens and Ladders, 146-147, 203.
 Vital Statistics, 83.
 Burgess, Thornton W., 137.
 Burke, Jack, 104, 199.
 Burnham, John B., 33, 186.
 Burroughs, John, 137.
 Buzzard, 155.

C

Cabinet meetings, improve cooperation, 145.
 Cabrilla, 168.
 Cacomixtle, 78.
 Cahill, James, 64.
 California Development Association, 140.
 CALIFORNIA FISH AND GAME, 14, 30, 100, 149, 196.
 California-Oregon Power Company, 92.
 California State Redwood Park, 144, 202.
 Callander, W. C., 85.
 Calvin, A. Raymond, 84.
 Campbell, Charles A. R., 136.
Cancer magister, 195.
 Canner, 134.
 Canvasback, 171.
 Carnegie Institution, 71.
 Carp, 50, 59, 66, 67, 114, 158, 214.
 Carpenter, Cecil, 85.
 Carpenter, S. J., 101.
 Casagrande, Louis, 85.
 Cassenoix, 155.
 Cat, Band-tailed, 78.
 Coon, 78.
 House, 78.
 Ring-tailed, California, 77-78.
 Catfish, 50, 67, 114, 158, 214.
 Cavezas, Rigo, 85.
 Chemical composition of fish changes with age, 187-188.
 Cheney, E. S., 181.
 Chickadee, Oregon, 131.
 Chicken, 205.
 Chilipepper, 50, 114, 158, 212.
Chione fructifraga, 167.
 Cholera, 32.
 Civil Service, 79, 148.
 Clam, 67, 72, 73, 135, 189.
 Cockle, 51, 115, 159, 215.
 Cockle hardshell, 167.
 Mixed, 51, 115, 159, 215.
 Pismo, 51, 115, 149, 159, 201, 202, 215;
 depletion of, in California, 117-124.
 Softshell, 51, 115, 159, 215.
 Clark, Frances N., 39, 40; conservation of
 the grunion, 161-166.
 Clark, G. A., 58, 61.
 Clark, G. O., 58.
 Clark, G. H., 146.
 Clark, M. S., 101, 104, 199.
 Clarke, Frank, 107.
 Clock, Ralph H., 30; fish and game com-
 missioner, 28.
 Clubs, gun, as game protectors, 172.
 Cod, Rock, 202.
 Code, of an angler, 39.
 Coleman, George A., 33, 74, 102; conditions
 of existence of fish in Lake Tahoe and
 tributary streams, 23-27.
 Combs, W. L., 80.
 Commercial Fishery Notes, 45, 105-106,
 149-151.
 Commission, work reorganized, 29-30,
 work praised, 31; Alaska game, 90;
 in touch with conservation clubs, 145.
 Commissioner, fish and game, 182; game
 and fish of Vermont, 192; board of,
 Pennsylvania, 109.
 Committee, to investigate status of ruffed
 grouse, 41; California man appointed
 on advisory, 80-81.

Common sense vs. sentimentalism in rela-
 tion to sports, 141-142.
 Condor, California, 153.
Condor, The, 34, 186.
 Congress, International, held in Copen-
 hagen, 193.
 Connell, M. J., 30.
 Conner, Geraldine, 134.
 Conservation, 13, 40, 82, 87, 97, 99, 101, 102,
 137, 142, 144, 166, 185, 186, 193, 197;
 fur essential, 35; of wild life presents
 complex problems, 42-43; agencies
 reorganized in Minnesota, 46; com-
 mission in touch with clubs, 145;
 fish and game, Dr. Jordan discusses,
 188-189.
 Conservationist, 81, 92.
 Convention of fish and game employees, 79.
 Conzet, Grover M., 46.
 Coolidge, Calvin, 81.
 Coombs, Frank L., 181.
 Coot, 98, 155, 196.
 Corbina, 167, 168.
 Cormorant, 34, 44, 88, 155.
 Correction, 196.
 Coudere, Leon, 104.
 Court, decision, an important, 134.
 Coyote, 43; Siskiyou County pays a
 bounty on, 108.
 Crab, 51, 62, 66, 67, 105, 115, 149, 159,
 215.
 Fiddler, 72.
 Pacific Coast, chemical composition of,
 195.
 Craig, J. A., a new fishery in Mexico, 166-
 169.
 Crappie, 209.
 Crawfish, 76.
 Crowley, Charles, 85.
 Crees, Robert, 73, 181.
 Croaker, 166.
 Cross, Henry, 142.
 Cross, Roy, 142.
 Crow, 5, 138, 155.
 Hooded, 155.
 Crustacean, 51, 64, 66, 67, 75, 76, 105, 115,
 159, 215.
 Cultus Cod, 50, 114, 158, 214.
 Cuneo, Angelo P., 84.
 Curtis Publishing Company, 169.
 Cuttlefish, 51, 115, 159, 215.
Cynoscion, 166.
 macdonaldi, 166.
 nobilis, 166.
 xanthulus, 167.

D

Daily, Clifford, 85.
 Dalton, A. E., 140.
 Dam, Otay, 87.
 Trancas, 65.
 Davis, H. S., 153.
 Dawson, W. L., 180.
 Decoy, 97.
 Deer, 32, 35, 44, 89, 91, 106, 141, 142, 149, 154,
 170, 173, 174, 185, 189; disease, inves-
 tigations of, in Mendocino County,
 107-108; Missouri closes season on,
 109; suggested dates on open season
 of, in California, 124-127; barbed
 wire fence causes death of, 151-152;
 hunters, Kaibab Forest to be opened
 to, during October, 188.
 Black-tailed, 125; successfully reared,
 35-37.
 Mule-tailed, 47, 127; annual kill of in
 Modoc County, 33.
 Rocky Mountain mule-tailed, 125, 126.
 White-tailed, 153, 173; Missouri intro-
 duces, 209.
 DeLaveaga, J. V., 187.
 Delta Farms Company, 80.
 Denmead, Talbott, 196.
 Dennis, W. H., 80.

Department of Commercial Fisheries, 13, 14, 16, 28, 29, 30, 75, 79, 80, 81, 105, 106, 134, 146, 150, 201.
 Fishculture, 33, 101, 128, 144, 145, 183, 200-201; screens and ladders, 30.
 Patrol, 30, 148-149, 199-200.
 Depletion, 69; causes of fur, 38.
 Deputy, 81, 101, 149, 182, 184.
Development Bureau News, 142.
 Diatom, 71.
 Dickey, Donald, 181.
 Disease, 32, 183, 185, 186, 193; deer, investigation of, in Mendocino County, 107-108; duck, to be studied, 183; gray squirrel, still exists, 205-206.
 Diver, 155.
 Dixon, Joseph, 103, 139, 186.
 Dobbs, A. C., 66.
 Dobelstein, William G., 183.
 Doble, A. C., 64.
 Doe, 125, 154, 174, 188, 209; a horned, 47.
 Dog, 109, 149, 186.
 Dolphin, 50, 114, 158.
 Donaldson, H. J., 79.
 Dove, 7, 196.
 Mourning, 6; life history and habits of western mourning, 175-180.
 Turtle, 155.
 Drainage, 137, 185, 191.
 Duck, 20, 22, 40, 67, 73, 81, 83, 94, 95, 97, 98, 155, 170, 171, 174, 185, 190, 191, 193, 198; die from alkali poisoning, 32; the formula for, 171; alkali poisoning of, 182-183; disease to be studied, 183; season shortened, 184; federal power and, bag limits, 185; successfully reared, 187; food, Montana plants, 208.
 Black, 171, 174.
 Eider, 98.
 Fulvous, 187.
 Gray-breasted, 187.
 Red-billed, 187.
 Spoon-bill, 187.
 White-faced, 187.
 Varied, 187.
 Wood, 98, 171, 187.
 Dugan, James J., 203.
 Dunbar, H. R., 30.
 Dunwoody, Charles G., 140.
 Durbrow, William, 80.

E

Eagle, 137.
 Bald, 138.
 Golden, 155; extermination in England, 139; destruction of in California, 153.
 Earnshaw, Frank L., 196.
 Ecrevisse, 51, 115, 159.

EDITORIALS:

Ralph H. Clock, fish and game commissioner, 28; Fish and Game Commission reorganized, 28; the new executive officer, 28-29; commission's work reorganized, 29-31; service bulletin will be issued, 31; commission's work praised, 31; in memoriam, Henry J. Abels, Bernard Luttrell, 31-32; ducks die from alkali poisoning, 32; hatchery water supply, 32; game laws become popular, 32; new plans for game refuge bill, 32-33; the game warden needs support, not criticism, 33; plan biological survey of Lake Tahoe, 33; the annual kill of mule deer in Modoc County, 33; the world's record broad-billed swordfish, 34; violator heavily fined, 34; are we coming to closed seasons on trout, 34; pelicans and fish, 34-35; California leads in fisheries, 35; mountain sheep introduced, 35; fishing at Catalina, 35; fur conservation essential, 35; black-tailed deer successfully reared, 35-37; open seasons for fur bearers,

37-38; an anti-pollution platform, 38; causes of fur depletion, 38; Arizona escapes game law muddle, 38-39; the real sportsman and the bag limit, 39; warden posts signs, 39; life history of the grunion, 39-40; California's game girls enjoy winter in Alaska, 40; back to primitive methods, 41; organization seeks limitation of firearms, 41; food of phalaropes, avocets and stilts, 41; committee to investigate status of ruffed grouse, 41-42; proposed sanctuary for wild animals in South Africa, 42; vireos deserve encouragement, 42; conservation of wild life presents complex problems, 42-43; a fisherman to his son, 43; striped bass number, 79; plan determination of age and rate of growth of striped bass, 79; trout tackle for striped bass, 79; convention of fish and game employees, 79-80; brief reports on current activities will appear under new department heading, 80; screen and ladder conference, 80; California man appointed on advisory committee on fisheries, 80-81; a new international fisheries commission, 81; new Yosemite hatchery, 81; violators take notice, 81; new rearing ponds constructed, 82; our great task, 82-83; plying out the bag limit, 83; hunting accidents, 1925, 83-86; hunting accident data 1924 and 1925, 87; district attorney warns hunters, 87; the issue of the range, 87; wild turkeys tried in San Diego County, 87; water pollution, 87-88; best game warden, 88; new pollution problem, 88; rare trout from lower California, 89; meager information on game violations leads to conviction, 89-90; Alaska has game commission, 90; real results in bird banding, 90; effect of oil pollution on marine and wild life, 90; Sonoma County schools hold bird study contest, 90-91; protective association formulates principles, 91; lumbering town has many hunters, 91; lower Klamath Lake still a problem, 91-92; migratory insectivorous birds are the farmers' friends, 92; beavers rapidly exterminated in Oregon, 93; to a boy with a gun, 93-95; six rules for sportsmen, 95; homing instinct in red salmon, 95; hunting licenses swell state revenues, 95-96; use black powder to frighten birds, 97; market growing for game propagated in captivity, 97-98; federal bag limits reduced, 98; an important court decision, 134; N. B. Scofield attends meeting of International Fisheries Commission, 134; grunion needs protection, 134-135; two new fish hatcheries, 135; economic value of the Mexican free-tailed bat, 135-137; conditions affecting migrating wild fowl, 137; destruction of predatory birds, 137-139; golden eagle extermination in England, 139; ruffed grouse disease, 139-140; San Benito County receives Mexican bobwhite quail, 140; committee to study game conditions, 140; exceeding bag limits, 140; humane capture of fur-bearers, 140-141; common sense vs. sentimentalism in relation to sports, 141-142; recreational lands, 142; new botanical garden, 142; boy scouts make game case, 142; new teachers' bulletin on fish and game laws, 143; new motion picture films obtained, 181; state game farm dedi-

- cated, 181; Yosemite fish hatchery dedicated, 181-182; license numbers of game violators' cars needed, 182; alkali poisoning of ducks, 182-183; duck disease to be studied, 183; state fair exhibit, 183; new dollar-a-year wardens help law enforcement, 183; President Zellerbach receives gold medal, 183-184; duck season shortened, 183-184; what would you do, 185; federal power and duck bag limits, 185-186; Audubon Society lauds sportsmen's organizations, 186; true sportsmen, 186; rarest of bird's eggs discovered in Alaska, 186; buffalo once native of California, 186-187; beaver disappearing in San Joaquin Valley, 187; ducks successfully reared, 187; chemical composition of fish changes with age, 187-188; area added to Sequoia National Park, 188; Kaibab forest to be opened to deer hunters during October, 188; Dr. Jordan discusses fish and game conservation, 188-189; adverse factors menacing wild fowl, 189-191; new tuna boat to be cork lined, 191; the elimination of "haff sickness", 191-192; H. P. Sheldon appointed chief U. S. game warden, 193; chief U. S. Game Warden Sheldon says conservationists are winning, 192-193; plover season closed by federal regulation, 193; international congress held in Copenhagen, 193; economize on pink salmon, 193-194; chemical composition of Pacific Coast crabs, 195; marked fish return, 195; salmon marking experiments in Oregon, 195-196; correction, 196; new bulletin issued on game laws, 196-197.
- Edwards, 122, 123.
Eel, 50, 114, 158, 214.
Eggs, rarest of, discovered in Alaska, 186.
Bass, striped, 60, 65.
Dove, 177.
Grunion, 39, 135, 165.
Perch, 187.
Pheasant, 99, 147.
Rainbow trout, 145.
Salmon, 103, 150.
Sturgeon, 108.
Surf bird, 186, 198.
Trout, 103, 187.
Elk, 35, 46, 82.
Engelke, Walter, 34.
Euthymus bonito, 105.
Evermann, B. W., 74, 140.
Executive officer, the new, 28, 30.
Exhibit, state fair, 183, 184.
- F**
- Facts of Current Interest, 44, 99, 144, 198.
Falcon, Peregrine, 155.
Prairie, 137.
Fawn, 35, 107, 152, 174, 188.
Federal Bird Protection Act, 154.
Fellows, C. R., 195.
Ferrante, Petro, 17.
Films, new motion picture, obtained, 181.
Fingerlings, Minnesota plans to plant, 46.
Firearm, organization seeks limitation of, 41.
Fish, pelicans and, 34-35; conditions of existence in Lake Tahoe and tributary streams, 23-27; frozen, imported from Japan, 45; planting, new method adopted by Fish and Game Commission, 128-130; planting, new policy of, 145; Arkansas still has no protection on, 153; chemical composition of, changes with age, 187-188; marked, return, 195.
Fish and Game Commission, Alaska, 40, 43.
Arizona, 38.
Arkansas, 153;
British Columbia, 46.
California, 10, 14, 23, 29, 30, 31, 34, 39, 45, 47, 56, 57, 58, 60, 63, 71, 75, 80, 81, 82, 88, 90, 99, 100, 104, 105, 118, 122, 129, 134, 135, 139, 140, 144, 145, 146, 147, 149, 154, 184, 189, 200; reorganized, 28; adopts new policy of fish planting, 128-130.
Illinois, 109.
Massachusetts, 41.
Minnesota, 46.
Missouri, 154, 209.
Montana, 207, 208.
Oregon, 12, 109, 195, 206, 207; able to close streams, 206.
Pennsylvania, 79, 83.
Territory of Hawaii, 58.
Utah, 32, 33.
Fish and Game Commissioners, Western Association of, 32, 33.
Fish and game employees, convention of, 79.
Fish and Game Protective Association, 99, 103, 145.
San Benito County, 140.
San Diego, 87.
San Joaquin, 91, 124.
Fisher, C. O., meager information on game violations leads to convict, 89-90.
Fisherman, 68, 134, 141, 150, 203, 206; to his son, 43.
Fishery, 147; California leads in, 35; statistics for 1925, 105; regulation, new Mexican treaty includes, 106; a new, in Mexico, 166-169.
Tuna, 19, 35, 105.
Fishing at Catalina, 35.
Fiske, Herbert, 85.
Flatfish, 105.
Fleckenstein, Bruce, 194.
Fleckenstein, C. I., 194.
Flicker, 92, 131, 132.
Red-shafted, 5, 7.
Flounder, 45, 50, 105, 114, 158, 214.
Flycatcher, 3.
Follett, W. I., 204, 205; prey of the versatile rainbow, 204.
Food, in rearing pen, 11.
Birds, 3, 189.
Blue heron, 7.
Crow, 5.
Deer, 37.
Dove, 6, 7, 179.
Fish, 33.
Flicker, Red-shafted, 5, 7.
Goldfinch, 7.
Grosbeak, 5.
Hawk, 139.
Meadow lark, 2, 5.
Nighthawk, 5.
Owl, 7, 139, 189.
Phalaropes, avocets, stilts, 41.
Rainbow Trout, 204.
Robin, 3, 4, 6.
Sea Lion, 146.
Shrike, 205.
Striped Bass, 66, 73.
Swallow, Cliff, 5.
Forbes, S. A., 6.
Forest and Stream, 39, 142.
Fox, 153, 174.
California Gray, 77.
Fox, H. K., 80.
Franks, H. E., 92.
French Academy of Science, 2.
French, Grace M., a bird house colony, 130-133.
Frink, Maurice M., a fisherman to his son, 43.
Frog, 51, 77, 115, 159.
Fry, trout, 130.
Fry, Walter, California ring-tailed cat, 77-78.
Fuentes, Louis A., 137.

Fur, conservation essential, 35; causes of depletion, 38; farm, 43.
Fur-bearer, 35, 38, 43; open seasons for, 37.

G

Galespie, F. A., 34.
Gallinule, 98, 196.
Game, 28, 35, 39, 144, 155, 170, 172, 173; bird, California, enjoy winter in Alaska, 40-41; market growing for, propagated in captivity, 97-98; committee to study conditions, 140; boy scouts make, cases, 142; Missouri introduces, 153-154.
Game farm, 26, 86.
State, 9, 44, 80, 99, 103, 147, 148, 183, 184, 198, 203; California new state, 10-13; state, dedicated, 181; Massachusetts adopts new system, 207.
Game laws, become popular, 32; repeal bill, 38.
Game warden, the best, 88; needs support, not criticism, 33; H. P. Sheldon appointed chief, 192; chief, U. S., Sheldon says conservationists are winning, 192-193.
Game violator, license numbers of cars needed, 182.
Gammarus, 67.
Garrison, Henry, 140.
Geomys bursarius, 152.
Germond, Ramona, 85.
Gilbert, Charles H., 95.
Gilloon, S. R., 199, 200.
Gilmore, Charles, 28.
Glazier, G. O., 87, 88.
Glenn-Colusa Irrigation District, 80.
Glos, Ed, 73.
Glutton, 188.
Goat, Mountain, 189.
Rocky Mountain, 46.
Wild, 35.
Goatsucker, 3.
Godsil, H. C., shrike attacks young quail, 204-205.
Goggle-eye, 209.
Goldfinch, 7.
Goldfish, 26.
Goldman, E. A., 136.
Goose, 20, 40, 97, 98, 191; return on, banded, 152.
Cackling, 152.
Honker, 194.
Wild, 155.
Gopher, 7, 77, 78, 189; pocket, forage habits of, 152.
Shaw's pocket, 152.
Goshawk, 155.
Grant, Hugh, 202.
Grayfish, 50, 114, 158, 214.
Grebe, 155.
Greco, John, 85.
Green, Sherwood, 140.
Green, W. J., 45; salmon favored by unusual conditions, 108; sturgeon on increase, 108-109.
Greene, B. D. Marx, 28, 29, 30, 145, 181; Fish and Game Commission adopts new method of fish planting, 128-130.
Greenfish, 50, 114, 158.
Grey, Zane, 31.
Griffin, Ray, 199.
Grimes, C. O., 129.
Grinnell, Joseph, 107, 136, 180.
Grosbeak, 5.
Gross, A. O., 41, 139, 209.
Grouse, 155, 172; Michigan closes hunting for year, 208-209.
Ruffed, 170, 209; committee to investigate status, 41-42; disease, 139-140.
Grunion, conservation of the, 161-166; life history of, 39-40; needs protection, 134-135.
Guinea Fowl, 97.
Gull, 59, 139.

H

Haff sickness, the elimination of, 191-192.
Hake, 50, 114, 158, 214.
Halibut, 20, 50, 105, 114, 158, 214.
Bastard, 45.
California, 134.
Northern, closed season for, 45.
Hall, E. Raymond, 34; economic value of Mexican free-tailed bat, 135-137; golden eagle extermination in England, 139; new teachers' bulletin on fish and game laws, 143; barbed wire fence causes death of deer, 151-152; forage habits of pocket gopher, 152; new method of predatory mammal control, 154; oil pollution, 154.
Hammond, L. W., 180.
Hanna, Wilson C., destruction of the golden eagle in California, 153.
Hanson, James, 85.
Hanson, Peter, 84.
Hardhead, 50, 66, 114, 158, 214.
Harris, Manly, 140, 149.
Hart, V. A., 140.
Hatchery, 26, 33, 60, 61, 62, 82, 99, 208; water supply, 32; two new fish, 185; new, planned, 145; Missouri increases facilities, 209.
Bear Lake, 103.
Fall Creek, 103.
Fort Seward, 82, 103, 145.
Kaweah, 102.
Mount Shasta, 99, 145, 198, 200, 201.
Mount Whitney, 201.
Notes, 145.
North Creek, 149.
Rae Lakes, egg collecting station, 102.
Tahoe, 32.
Yosemite, 198; new Yosemite, 81; Yosemite fish, dedicated, 181.
Hawk, 7, 39, 78.
Broad-winged, 139.
Buzzard, 138.
Cooper, 137.
Duck, 137, 178.
Marsh, 7, 138.
Red-bellied, 137.
Red-shouldered, 137, 138, 139.
Red-tailed, 138, 170.
Rough-legged, 138, 139.
Sharp-shinned, 137.
Sparrow, 131, 139, 155.
Hearst, W. R., 35.
Hellard, John K., what would you do, 185.
Hemphill, B., 84.
Heron, 150, 155.
Blue, 7, 138, 139, 189.
Herring, 50, 114, 158.
River, 65.
Herrington, Wm. C., depletion of the Pismo clam in California, 117-124.
Higgins, Elmer, 81.
Hill, J. R., 190.
Hinds, Archibald F., 84.
Hobby, 155.
Hobson, Phil., 200.
Hohenshell, A. B., 19.
Hollingsworth, Douglas, 58, 61.
Holmes, Harlan B., 195, 196.
Hombom, H. B., 207.
Hooper, George Wm., Foundation for Medical Research, 183.
Hoover, Herbert, 80.
Horse, 22.
Huber, W. L., 80.
Hudson, W. H., 137.
Hughes, Charles E., 32.
Hulit, Leonard, 74.
Hummingbird, 3, 6.
Hunt, 199.
Hunter, 43, 44, 88, 94, 98, 141, 153, 170, 173, 174; district attorney warns, 87; in lumbering town, 91.
Hunter, J. S., 28, 30, 31, 104, 149.

Hunting, with animal blinds in Merced County, 20, 22.
Hunting club, Illinois licenses, 110.

I

Ibis, 139.
Imperatrice, James, 84.
Insect, 3, 6, 7, 8, 11, 24, 77, 89, 92, 137, 150.
International Association of Game, Fish and Conservation Commissioners, 33.
International Fisheries Commission, 81, 106, 134.
International Halibut Commission, 45.
Investigation, 32, 44, 146; food of birds, 3; of deer disease in Mendocino County, 107-108; salmon and striped bass, 146.
Irvine, R. J., 103, 183, 201.
Isopod, 67.
Issue of the range, 87.
Izaak Walton League, 33.

J

Jay, 155.
Stellar, 155.
Jeffers and Knight, 22.
Jerky, 199.
Johnson, 64.
Johnson, George S., 149, 199.
Johnson, Ellis C., 104.
Johnson, Hiram, 92.
Johnson, J. Sub., 140.
Jones, I. A., 47.
Jordan, D. S., 74; doctor, discusses fish and game conservation, 188-189.
Jump, J. W., 35.

K

Kaibab forest to be opened to deer hunters during October, 188.
Kajoura, 45.
Kauffman, Earl R., 140.
Kelly, 64.
Killdeer, 92.
Kingbird, Western, 6.
Kingfish, 50, 114, 158, 214.
Kingfisher, 138.
Kite, White-tailed, 137.
Klamath Lake Bird Reservation, 92.
Klamath Lake, Lower, still a problem, 91-92.
Kluber, George, 152.
Knapp, James, 22.
Knight and Jeffers, 22.

L

Laboratory, State Fisheries, 30, 39, 81, 102, 118, 134, 149, 165.
Lacey Act, 35, 192.
Lamb, C. A., 142.
Lamb, Chester C., 89.
Lambert, 22.
Lambson, G. H., 61, 201.
Lane, D. R., 31.
Lang, Ed, 22.
Latieze, Charles, 104.
Law, 22, 26, 28, 29, 32, 34, 38, 43, 46, 83, 91, 140, 179, 184, 186, 193; fur, 37; game, Arizona escapes, muddle, 38; game, become popular, 32; fish and game, 79, 104, 143; protective, 166; fish and game, new teachers' bulletin on, 143; enforcement, new dollar-a-year wardens help, 183; new bulletin, issued on game, 196-197; Missouri has unique, 208.
Lawyer, G. A., 192.
Lecture, 44, 110, 144, 147; record of, 104.
Leuresthes tenuis, 39, 40, 162.
Lewis, E. H., 203.
License, 110, 196.
Angling, 144, 147.
Hunter's, 96, 144, 182; swell state revenues, 95-96.

Ligitos, Mike, 92.
Limit, bag, 88, 143, 186.
Size, 68, 69.
Limpet, 51, 115, 159.
Lindley, Albert, 140.
Linnet, 73.
Lion, Mountain, 43, 126, 188, 190.
Lippincott, Wm., 101, 206; Siskiyou County pays a bounty on coyotes, 108.
Little, R. J., 149.
Lizard, 77.
Lobster, Spiny, 51, 105, 115, 134, 159, 215; a season at San Diego, 75-76.
Lough, McPherson, 199.
Lowe, J. N., 142.
Ludlum, Roy, 107, 183.
Luttrell, Bernard, In Memoriam, 32, 84.
Lux, 22.
Lynx, 87.
Canada, 43.

M

Mace, B. H., 87.
Mack, Ernest, 85.
Mackerel, 17, 20, 50, 105, 114, 158, 214.
Spanish, 167.
Maddox, Coburn F., spiny lobster season at San Diego, 75-76.
Madsen, D. H., 32, 33.
Magpie, 155.
Makings, James A., 134.
Mallard, 83, 170, 171, 174.
Mallen, Henry J., 34.
Malone, W. C., 142.
Mammals, fur-bearing, 38; predatory, new method of control, 154.
Mann, Albert, 71.
Manning, Elisa, 22.
Marlin, 51, 114, 158, 214.
Marlowe, Thomas N., 208.
Marten, 207.
Martin, Benton, 106.
Martin, Charles, 142.
Mason, Jay R., 85.
Mather, Stephen T., 181.
Maubert, Joe, 200.
McAtee, W. L., 3, 97.
McCauley, Al, 84.
McCloud, L. C., 140.
McDonald, Evans, 199.
McDonald, J. F., 203.
McDowell, Perry, 22.
McGee, D. P., 84.
McPherson, Robert, 181.
Meadowlark, 5, 6, 92.
Western, 2.
Menhaden, 19, 71.
Merriam, C. Hart, 186.
Method, back to primitive, 41.
Microtus, 205.
Migration, 14, 26, 40, 59, 65, 70, 95, 105, 137, 150, 196.
Migratory Bird Treaty Act, 41, 98, 143, 192, 193.
Miller, 22.
Miller, W. de W., 137.
Mills, Walter, 85.
Milt, 61.
Minnow, 24, 67, 135.
Missouri Game and Fish News, 154.
Modena, M. O., 191.
Moffitt, James, suggested dates of open season on deer in California, 124-127.
Moffitt, H. C., 126.
Mollusk, 51, 66, 90, 105, 115, 118, 159, 215.
Money, in the bank, 13-16.
Montana reports activities, 207.
Moore, Wade, 200.
Moorhen, 155.
Mosquito, 136.
Motion picture, film, 144, 198.
Mouse, 77, 78.
Field, 189.
Mullet, 50, 114, 158, 167, 168, 214.
Murie, O. J., 152.

Murphy, Warren, 85.
 Murre, 150.
 Museum of Vertebrate Zoology, 143, 186.
 Muskrat, 38, 46.
 Mussel, 51, 72, 115, 159, 215.
Mycteroperca jordani, 167.
Mysis, 67.

N

National Association of Audubon Societies, 33, 185.
 National forest, 87.
 El Dorado, 204.
 Modoc, 33.
 Minidoka, 154.
 National Fur Association, 139.
 National Park, Lassen, 33.
 Sequoia, 78, 91; area added to, 188.
 Yosemite, 81, 99, 147, 202.
 National Park Service, 81, 99.
 Neale, George, 28, 63, 72.
 Nelson, E. W., 43, 136, 153, 191.
Nereis, 67.
 Net, 64, 69, 70, 101, 102.
 Casting, 150, 151.
 Gill, 68.
 Round haul, 168.
 Nevis, Lloyd, 85.
 Newbert, Frank M., 28.
 Newsome, J. E., 101; hunting with animal blinds in Merced County, 20-22.
 New York Waterways Association, 38.
 Nidever, H. B., purse seining in Southern California, 45.
 Nighthawk, 3, 5.
Nos Oiseaux, 154, 155.
 Nuthatch, 155.

O

O'Hare, Roy, 84.
 O'Malley, Henry, 81, 106.
 Opossum, 38.
 Oregon closes certain lakes, 109.
Oregon Sportsman, 154, 189, 195.
 Ortega, James L., 204.
 Osprey, 137.
 Ostrich, 97.
 Otter, 39.
Outdoor Life, 95.
Outlook, 38.
 Ouzel, Water, 150.
 Over-fishing, 71.
 Owl, 7, 138, 155, 189.
 Barn, 139.
 Horned, 137.
 Long-eared, 138, 139.
 Screech, 139.
 Short-eared, 139.
 Oyster, 51, 62, 115, 159, 215.
 Eastern, 51, 115, 159, 215.
 Native, 51, 115, 159.

P

Pacific Fisherman, 106, 191.
 Pacific Gas and Electric Co., 80, 135, 145, 146.
Panulirus interruptus, 75.
Paralabrax maculatofasciatus, 167.
Paralithodes camtschatica, 195.
 Parks, C. T., 195.
 Partridge, 155, 208.
 Hungarian, 12, 103, 148, 183, 208; Oregon succeeds with, 207.
 Peafowl, 97.
 Pearson, A. G., 58.
 Pearson, T. Gilbert, 33; Audubon Society head lauds sportsmen's organizations, 186.
 Pee-wee, 43.
 Pelican, 6; and fish, 34-35.
 Brown, 44.
 White, 34, 44, 88.
 Pelt, beaver, 187.

Pennsylvania issues educational bulletin, 109.
 Perch, 50, 56, 114, 158, 188, 214.
Perognathus, 205.
 Peterson, James, 22.
 Phalarope, food of, avocets and stilts, 41.
 Pheasant, 11, 12, 44, 97, 98, 129, 155, 183, 198, 203, 207.
 Golden, 148.
 Lady Amherst, 148.
 Mongolian, 147, 148.
 Reeves, 148.
 Ring-necked, 9, 10, 13, 103, 148.
 Silver, 148.
 Philadelphia Academy of Sciences, 137.
 Pigeon, Band-tailed, 178.
 Passenger, 97.
 Wild, 155.
 Pike, 50, 114, 158, 214.
 Riffle, 135.
 Pintail, 171.
 Chilean, 187.
 Plan biological survey of Lake Tahoe, 33.
 Plankton, 24, 189.
 Plover, 155.
 Black-billed, 98, 196.
 Golden, 98, 196.
 Pochard, Rosy-billed, 187.
 Poisoning, ducks die from alkali, 32.
 Pollution, 39, 46, 71, 74, 90, 99, 103, 184, 186, 189, 202; anti, platform, 38; water, 87-88; problem, a new, 88; oil, effect of on marine and wild life, 90; oil, 154; stream, in Oregon, 206-207.
 Pompano, 50, 114, 158, 168, 214.
 Pond, new rearing constructed, 82.
 Porter, Jack, 89.
 Powell, Tod, 31.
 Prairie chicken, 97.
 Pratt, Richard, 200.
 Pratt, Samuel, 84.
 Prawn, 167.
 Preserve, 172; see refuge.
 Duck, 170.
 Game, 154, 188.
 Public, 172.
 Proctor, James N., 140.
 Propagation, 10, 31, 33, 38, 91, 97, 98, 142, 147, 195, 207, 208, 209.
 Proso, 147.
 Protection, game, 172.
 Protective Association, formulates principles, 91.
 Protozoa, 24.

Q

Quail, 10, 20, 83, 95, 97, 129, 148, 155, 178, 200; bobwhite, San Benito County receives Mexican, 140.
 Chinese, 12.
 Gambel, 12.
 Mexican, 12.
 Valley, 12, 103, 183, 204; shrike attacks young, 204-205.

R

Rabies, 43.
 Rabbit, 95, 141, 142.
 Cottontail, 149.
 Raccoon, 38, 77, 78, 173.
 Rack, 135, 147.
 Rail, 98, 155.
 Rampont, R. C., black-tailed deer successfully reared, 35-37.
 Ramsey, Levi, 85.
 Rapalli, M. A., 151.
 Rat, 77, 78.
 Raven, 155.
 Redshank, 155.
 Reed, Rolan, 84.
 Reeves, John, 22.
 Refuge, 43; Missouri increases system, 109.
 Game, 26, 32, 33, 126, 139, 142, 143, 209; bill, new plan for, 32.

Nevada, 154; Missouri plants grain in state, 208.
 1M, 102.
 4A, 142.
 Reindeer, 35.
 Report, 48, 111, 155, 210; brief, on current activities will appear under new department heading, 80.
 Reservation, federal bird, 171; *see* refuge.
 Rich, Willis H., 95, 196.
 Richardson, Gov. Friend Wm., 28, 79, 181, 182.
 Ricketts, Ed., 149.
 Ridgeway, Harry, 140.
 Roadrunner, 7.
 Roberts, D. E., 101.
 Robin, 3, 4, 6, 92, 93.
Roccus lineatus, 54, 56.
 Rockfish, 50, 114, 158, 214.
 Rod and Gun Club, Westwood, 91.
 Rodent, 43, 138.
 Rook, 155.
 Rooney, Tom, 22.
 Roosevelt Wild Life Experiment Station, 139.
 Ross, Arthur A., 199.
 Ross, A. F., 200.
 Roundtree, S. B., 22.
 Royal Society for the Protection of Birds, 139, 154.
 Rules, six, for sportsmen, 94.
 Russell, George, 85.

S

Sablefish, 50, 114, 158, 214.
 Saling, 22.
 Salisbury, Lord, 42.
Salmo henshawii, 24, 34.
irideus, 105.
nelsoni, 89.
 Salmon, 23, 50, 61, 67, 68, 69, 72, 105, 114, 150, 158, 201, 203, 214; watch for marked, 100; to be tagged on California coast, 105-106; favored by unusual conditions, 108; and striped bass investigation, 146; a questionnaire on, 150; economize on pink, 193-194; marking experiments in Oregon, 195-196.
 Blue-backed, 150, 195, 196.
 Chinook, 135, 150, 189, 194, 195, 201.
 Chum, 194.
 Coho, 150.
 King, 150, 189.
 Pacific, 189.
 Quinnot, 150.
 Red, homing instinct in, 95.
 Silver, 150.
 Sock-eye, 195.
 Spring, 150.
 Salmonidae, 23.
 Salvini, Pete, 84.
 Sanctuary, 171, 173, 175; proposed for wild animals in South Africa, 42; *see* refuge.
 Game, 173.
 Wild life, 169.
 Sandab, 50, 105, 114, 156, 214.
 Sanders, J. H., 148.
 Sandpiper, 155.
 San Joaquin Light and Power Company, 80.
Saprinus sulcifrons, 39.
 Sardine, 15, 19, 20, 29, 31, 45, 50, 67, 73, 105, 114, 158, 202, 214; California purse seines for, 16-19; catch of, 102; bulletin, 102.
Saturday Evening Post, 169.
 Schaeffle, E., 168.
 Schmiedell, E. G., 126.
 Sciænidæ, 166.
Science, 42, 192.
 Scofield, E. C., 146.

Scofield, N. B., 30, 74, 80, 81, 104, 106; striped bass in California, 55-76; attends meeting of International Fisheries Commission, 134; commercial fishery notes, 45, 105-106, 149-151.
 Scofield, W. L., 146; money in the bank, 13-16; purse seines for California sardines, 16-19.
Scomberomorus sierra, 167.
 Seoville, Samuel, 137.
 Scoven and ladder conference, 80; and ladders, 101.
 Law, 102, 184.
 Sculpin, 50, 105, 114, 158, 204, 214.
 Sea Lion, 146.
 Searing, Wiley, 142.
 Season, 69, 99, 185.
 Closed, 68, 70, 98, 143, 165; are we coming to, on trout, 34; for northern halibut, 45.
 Open, 37, 98, 143, 180; for fur bearers, 37-38; suggested date on deer, in California, 124-127.
 Rutting, 125.
 Sea Worm, 66, 67.
 Seine, purse, for California sardines, 16-19; in southern California, 45.
 Sellmer, W. B., 39.
 Selover, George H., 33.
 Service Bulletin, 101; will be issued, 31.
 Seton, Ernest Thompson, 137.
 Sette, O. E., 81.
 Shad, 50, 65, 68, 69, 105, 114, 158, 214.
 Shag, 59, 150.
 Shaw, Walter S., 86.
 Shebley, W. H., 30, 128, 145, 174, 183; our great task, 82-83.
 Shedder, 72.
 Sheep, Mountain, 188; introduced, 35; taken captive, 106-107.
 Sheepshead, 50, 114, 158, 214.
 Sheldon, H. P., appointed chief, U. S. game warden, 192.
 Shellfish, 76, 90, 135.
 Shore bird, 41.
 Shrader, Wm., 86.
 Shrew, 204, 205.
 Shrike, attacks young quail, 204-205.
 California, 205.
 Shrimp, 51, 64, 65, 66, 67, 73, 115, 189, 215.
 Sierra, 168, 169.
 Silverside, 162.
 Simpson, Gene M., 10.
 Skate, 50, 114, 158, 214.
 Skipjack, 45, 51, 105, 115, 159, 201, 214.
 Skogsberg, Tage, 18.
 Skunk, 38, 78.
 Slater, Herbert, 181.
 Smalley, E. W., 101.
 Smalley, Geo., 187.
 Smelt, 51, 115, 159, 214.
 Little, 39, 134, 162.
 Smith, Chas., 20, 22.
 Smith, Lillian, 22.
 Smith, Hugh M., 56, 57, 74.
 Smutz, E. W., 58.
 Snail, 51, 115, 159.
 Snake, 7, 78, 150.
 Water, 39.
 Snapper, 45.
 Snipe, 41, 78, 155.
 Jack, 98.
 Wilson's, 98, 196.
 Snow, Charles, 199.
 Snyder, J. O., 34, 79, 89.
 Soares, J. A., 191.
 Solaro, Louis, 84.
 Sole, 50, 105, 114, 158, 214.
 Sora, 98.
 Sorex, 205.
 Southern California Edison Company, 80.
 Southern San Joaquin Irrigation District, 80.
 Southern Sierra Power Company, 80.

Sparrow, 73, 155.
 Chipping, 5.
 English, 133.
 Spawning, 14, 39, 40, 56, 58, 59, 60, 65, 69, 70, 73, 95, 106, 108, 135, 145, 150, 189.
 Spencer, John, 146, 203.
 Sperry, Geo. and Willis, 86.
 Split-tail, 51, 66, 73, 115, 159.
 Sportsmen, 10, 13, 28, 40, 82, 90, 92, 94, 95, 99, 109, 138, 140, 145, 169, 185, 197; real, and the bag limit, 39; true, 186; Audubon Society lauds organization, 186.
 Sprig, 83.
 Squid, 51, 72, 115, 159, 215.
 Squirrel, Gray, 170; disease still exists, 205-206.
 Ground, 78, 139.
 Red, 131.
 Stag, 173, 174.
 Stanford University, 79, 89.
 Starks, E. C., 74.
 State Department of Agriculture, 92.
 Stilt, food of, phalarope, avocets, and, 41.
 Stingaree, 51, 115, 159.
 Stone, Livingston, 56.
 Stone, Witmer, 137.
 Storer, T. L., 136, 180.
 Strychnine, 178.
 Sturgeon, on increase, 108-109.
 Sucker, 51, 64, 115, 135, 159, 215.
 Surf bird, 186, 198.
 Surf fish, 51, 115, 159.
 Survey, plan biological, of Lake Tahoe, 33.
 Sutton, Geo. M., 109.
 Swallow, 3, 131, 132.
 Cliff, 5, 132.
 Violet-green, 132.
 Swan, 97, 98.
 Swim bladder, 166, 169.
 Swiss Society for the Study and Protection of Birds, 154.
 Swordfish, 31, 35, 51, 115, 159, 215.
 Broadbill, 35; the world's record of, 34.
 Marlin, 35.

T

Tadarida mexicana, 135.
 Tintan, Wm., 86.
 Task, our great, 82.
 Taylor, Ray, 89.
 Teachers' bulletin, new, on fish and game laws, 143.
 Teal, Blue-winged, 171.
 Green-winged, 171.
 Tern, 138.
 Terrapin, 51, 115, 159.
 Thayer, Gerald, 137.
Thomomys bottæ bottæ, 152.
 Thompson, A. J., 86.
 Thompson, Geo., 152.
 Thompson, R. M., 146.
 Thompson, W. F., 39, 81, 162, 165.
 Throckmorton, S. R., 56.
 Thrush, 155.
 Tinamou, Rufous, 44.
 To a boy with a gun, 93-95.
 Tomcod, 51, 115, 159, 215.
 Tonkin, Geo., 92, 93, 97.
 Torgny, Bruce, 89.
 Totuava, 166, 167, 168, 169.
 Trap, 78, 135, 146, 153, 170.
 Treaty, fisheries, 134; see migratory bird treaty.
 Trout, 23, 24, 31, 34, 35, 46, 51, 56, 61, 82, 115, 128, 144, 147, 157, 173, 183, 200, 213; are we coming to closed seasons on, 34; tackle for striped bass, 79; rare, from Lower California, 89; Oregon has new bag limit on, 109.
 Brown, 128, 200, 201.
 Eastern Brook, 189, 200.
 Golden, 198, 201.

Loch Leven, 128, 200, 201, 207.
 Mackinaw, 25.
 Nelson's, 89.
 Rainbow, 89, 129, 135, 200; prey of the versatile, 204.
 Sea, 50, 114, 158.
 Silver, 25.
 Steelhead, 33, 51, 72, 105, 115, 145, 159, 189, 200, 203; game fish in Washington, 154.
 Tahoe, 25.
 Tuna, 18, 34, 35, 45, 51, 105, 115, 146, 159, 215; new, boat to be cork lined, 191; canning season, 99.
 Bluefin, 51, 115, 159, 196, 201, 215.
 Yellowfin, 51, 115, 159, 196, 215.
 Tuna Club, 34, 35.
 Turkey, 97, 172, 174.
 Wild, 12, 170, 171, 174, 175; tried in San Diego County, 87.
 Turbot, 51, 115, 159, 215.
 Turtle, 51, 115, 159.
 Mexican, 168.
 Sea, 167.

U

U. S. Bureau of Biological Survey, 3, 29, 31, 34, 40, 42, 43, 90, 96, 97, 98, 103, 107, 138, 139, 152, 188, 189, 192, 193, 196, 197.
 U. S. Bureau of Fisheries, 23, 57, 60, 61, 63, 67, 68, 81, 90, 105, 106, 146, 147, 151, 153, 193, 201, 207, 208.
 U. S. Bureau of Reclamation, 91.
 U. S. Department of Agriculture, 3, 5, 35, 38, 41, 42, 43, 95, 96, 97, 184, 192, 196, 197, 205.
 U. S. Fish Commission, 56.
 U. S. Forest Service, 144.
 University of California, 79.
 Upper Mississippi Wild Life Fish Refuge, 43, 208.

V

Van Deventer, Wm. C., 146; barge fishing on the southern Californian coast, 19-20.
 Venison, 44, 142, 149, 172.
 Vermin, 138.
 Violation, meager information on game, leads to conviction, 89-90.
 Violator, take notice, 81-82.
 Vireo, deserve encouragement, 42.
 Bell, 42.
 Blue-headed, 42.
 Hutton, 42.
 Red-eyed, 5, 42.
 Warbling, 42.
 White-eyed, 42.
 Yellow-throated, 42.

W

Warden, 32, 33, 43, 81, 104, 140, 151, 153, 184, 193; the game, needs support, not criticism, 33; posts signs, 39; have no special privileges, 182.
 Dollar-a-year, 81, 101, 182, 199, 200; new, help law enforcement, 183.
 Waterfowl, 98, 153, 196.
 Watkins, Rolin G., 30, 88, 103, 104, 181.
 Weasel, 138, 188.
 West, Thomas J., 140.
 West, W. P., 64, 65, 67, 73.
 Western Association of State Game Commissioners, 33.
 Westwood Rod and Gun Club, 91.
 Weymouth, F. W., 118.
 What would you do?, 185.
 Whitebait, 51, 105, 115, 159, 215.
 Whitefish, 25, 33, 51, 73, 115, 159, 215.
 Whitney, Judge, 185.
 Widgeon, 171.
 European, 187.

Wildcat, 108.
 Wild fowl, 183; adverse factors menacing,
 189-191.
 Wild life, 26, 27, 40, 43, 82, 90, 141, 143,
 171, 193.
 Protection, 46.
 Wildie, M. J., 86.
 Williams, H. I., 200.
 Windle, Judge Ernest, 34.
 Wise investment by Wisconsin, 208.
 Woehlke, Walter V., 31.
 Wolf, 43, 188.
 Wolff, Wayburn, 142.
 Wolverine, 188.
 Woodbury, J. G., 56.
 Woodchuck, Illinois exterminating, 109.
 Woodcock, 155.
 Woodpecker, 4.
 Gairdner, 131.
 Lewis, 131.
 Red-headed, 138.

World's record broadbilled swordfish, 34.
 Wren, 3.
 House, 131.
 Seattle, 132.
 Wright, Edward A., 86.
 Wright, Geo., 186.

X

Xiphias gladius, 34.

Y

Yellowleg, Greater, 193.
 Lesser, 193.
 Yellowtail, 17, 51, 105, 115, 159, 215.

Z

Zar, Peter, 34.
 Zellerbach, L., 30, 31, 104, 145; president,
 receives gold medal, 183-184.